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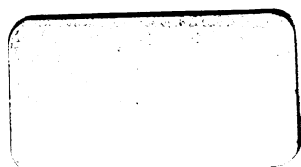
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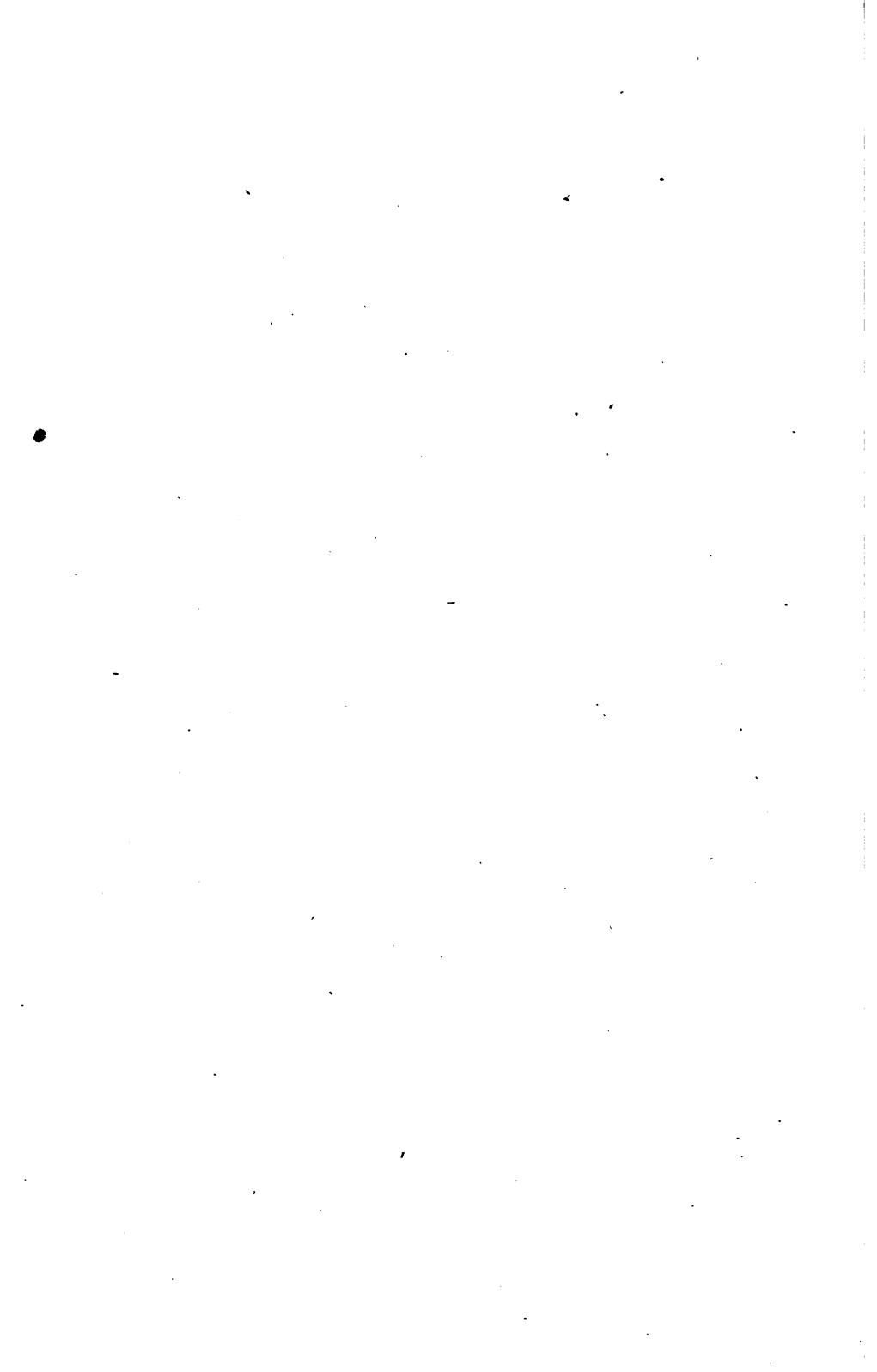
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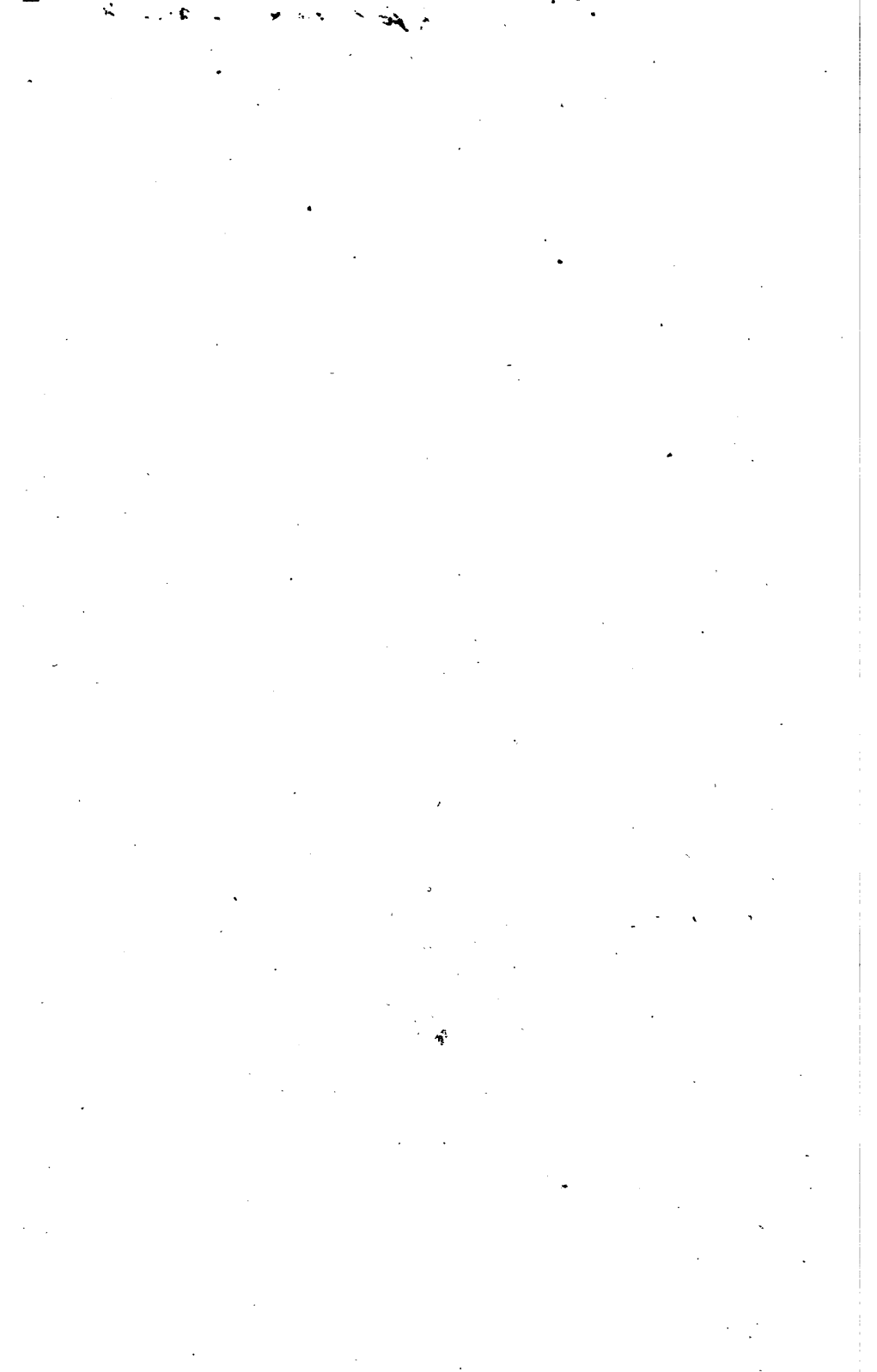




1838

Gift to William L. and W.

Eng 838.39.3



REPORTS
OF
THE ENGINEERS
OF THE
WESTERN RAIL ROAD CORPORATION,
MADE TO
THE DIRECTORS,
IN
1838-9.

SPRINGFIELD:
PRINTED BY MERRIAM, WOOD AND CO.
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REPORT

ON THE

FINAL LOCATION BETWEEN CONNECTICUT RIVER AND
THE WESTERN BOUNDARY OF THE STATE.

Springfield, March 16, 1838.

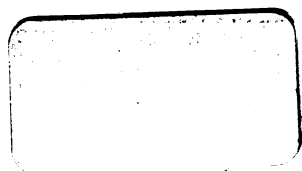
TO THE PRESIDENT AND DIRECTORS OF THE WESTERN
RAIL ROAD CORPORATION.

GENTLEMEN,

In obedience to the resolution of the Board of 10th August last, the several lines therein specified, have been definitively located, and the following Report upon the same, together with the accompanying descriptive memoirs, maps, profiles, and tables, embracing estimates of cost of construction, will, it is hoped, convey sufficient information to the Board to enable them to select from among the routes which have been located, that which shall appear to them to subserve best the interests of the corporation and the community at large.

Referring to the Reports of the 15th January and 12th June last, for a general description of the main route as approximately located, from Connecticut river to the western boundary of the State, we proceed to detail the various modifications which have been made in the same, with a view to the final location.

From the east bank of Connecticut river to the point of Tatham hill in West Springfield, 4 miles, the location pursues, without sensible deviation, the approximate line ; but from thence to Morley's bridge, at the eastern boundary of Westfield, the route instead of winding around the point of Grave-yard hill, by reversed curves of short radius, passes directly over the ridge, upon a single curve of 1910 ft. radius, necessitating an increased quantity of rock cutting, but in other respects, a great improvement in the line.





1838

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must be either the one or the other, throughout the entire distance. For example, at the third river crossing above Root's, the grade of the approximate line is 12 feet below that of the final location; this would require an excessive cut at the west spur of Walnut hill, if the location were taken as the continuation of the approximate line to avoid the four river crossings which are made by the latter line, and the same of other points above. The following is a summary of the principal results.

Routes.	Length Miles.	Deflection Degrees.	Radius Min.	Grade Max.	Cost of Graduation.
Approx. Location	6.463	665	996	82.18	301,500.00
Location.	6.402	787	1346	78.98	354,500.00
Differences.	0.061	122	350	3.20	53,000.00

Thence it appears, that the final location is 325 feet, or 0.061 miles shorter than the approximate line; that it has 122 degrees more deflection than the latter, but that the radius of least curvature is 350 feet longer, that it has 3.20 feet grade per mile less than the approximate, and that it has four river crossings less; opposed to these advantages, the other line, by the original estimates will cost 53,000 dollars less.

At the head of this long plane, and near the Washington boundary line, 1000 feet above M'Elwane's tavern, a stopping place has been provided for, where the grade is but 15 feet per mile; it extends 600 feet.

From this stopping place to Crane's, in Washington, 2 miles, the line is very direct and favorable, but from Crane's to a point beyond Sibley's, a distance of $1\frac{1}{2}$ miles, and embracing the heavy cut at the main summit, and the deep filling over the meadows on the east side, is another very expensive section, the grade being now 78.93: there is no alternative which can well be resorted to; the best that can be done, is to equalize, as nearly as practicable, the excavation and embankment. There is reason to suppose that at this summit, dividing as it does the waters of the Connecticut, from those of the Housatonic, we shall find a large quantity of rock, but whether rock or earth, the work is formidable in the extreme, and for very deep cutting, the cost is in favor of rock. For example, in an open cut of earth 70 feet deep and 30 feet base, slopes $1\frac{1}{2}$ to 1, and excavation at 20 cents per cubic yard, the cost per lineal foot, is

70.00 dollars. If it be a rock cut, 60 feet deep, 20 feet at bottom, with slopes of 1 to 5, the cost would be at 1.12 $\frac{1}{2}$ per cubic yard, 67,50 for each lineal foot. Finally the cost of a tunnel in rock of mica slate, or gneiss, of 22 feet in width, by 18 feet in height would be 65.00 per lineal foot; the cost in these various suppositions, being so nearly assimilated, it becomes a question of time, rather than expense. Both the approximate and final locations occupy very nearly the same ground between M'Elwain's, and the west side of Washington summit; at the west side, the location diverges to the eastward from the approximate line, pursuing the route recommended for further examination, in the Report of 12th June last, and instead of keeping the south side of the pond, over broken ground and expensive excavation, it passes directly through a part of the pond, and continues by a very direct line to Watkins', in Hinsdale, distant 3 miles. This line is 700 feet shorter than the approximate line, and gives 110 degrees less curvature, in addition to extending the radius of the same from 1432 to 2865 feet. In the estimate, a very large allowance has been made for the settling of the embankment across Mud pond. The cost of the two lines would be about the same, rather in favor of the location.

From Watkins' to the boundary line between Dalton and Pittsfield, about 7 $\frac{1}{2}$ miles, two distinct routes were located. One pursuing the general direction of the approximate line, across the bend of the river below Merriman's mill, or Plunkett's, the other passing around this bend by the immediate valley of the river, as suggested in the Report upon the approximate location of 12th June last. These lines embrace all the heavy grade on the west side of the summit. By a modification recommended in the descriptive memoir of Mr. Chesbrough, appended to this Report, a very material improvement in the river line may be effected, viz. the embankment upon that line being greatly in excess, by its present grade, it is very desirable that the entire plane should be lowered, without destroying the uniform grade, and thereby increase the inclination upon the upper portion of it. By removing Plunkett's factory dam 250 feet farther up the stream, and turning the line rather nearer to his buildings than it is now located, it will afford the means of lowering the grade 5 feet, a disposition which will cause a great reduction in the amount of embankment over Curtis' meadow, and consequent-

ly, much expense. The estimates however are made upon the supposition that the dam remains where it is; in other words the comparison is less favorable to the river line, than it would be, upon the other hypothesis. As at present projected, the two lines stand thus :

Routes.	Length.	Deflection.	Radius.	Grade.	Cost Graduation.
Main line.	26.76	755°	2265	79.99	538,875.07
River line.	27.03	839°	1910	75.50	525,066.74
Differences.	0.27	84°	955	4.49	13,808.33

In the above comparisons, the results are footed for the entire line from Washington to the western boundary of the state; the differences, then, will show the relative advantages. This remark will apply to all similar comparisons upon that part of the route which lies west of the summit: they have been thus tabulated in the general synopsis of routes, and it is continued here to preserve uniformity.

It will appear by the above table, that the disadvantages of the river line are these: length of the line is increased by 1400 feet or 0.27 mile, the deflection is increased by 84 degrees; on the other hand the radius of least curvature is decreased 955 feet, its cost is 13,800 dollars less than the main line, its grade, even now, is 4.49 less steep, it can be sooner graded than the other line, and when graded, can be kept in repair at a less cost, from the better nature of the soil.

Compared with the approximate location, the river line will cost 800 dollars the most; and comparing the main line with the approximate line, the difference in cost is 14,600 dollars in favor of the latter; unless the river line should be adopted, therefore, the approximate line will be the preferable route; the advantages presented by the location are not considered to be worth the difference in cost.

From the junction of the main and river lines, near the Dalton and Pittsfield boundary, the main route, as located, pursues a very direct course to the northern part of the village of Pittsfield, nearly 4 miles, crossing in its route the Housatonic at Goodrich's, and requiring at that point a heavy embankment. In reference to this embankment, it is to be stated that the earth to form it, is to be borrowed, whether the main line or the river line is adopted; the principal cut in the main line, is too far from this embankment (4 miles) to make use of the excavated material, while it can be dug

on the spot for 6 cts. a yard, and hauled for 6 cts., a much less price than the earth can be transported by temporary rail way from the cut above referred to, over a grade of 80 feet.

From Pittsfield the line after crossing the Pontoosuc river, at Pomeroy's satinet factory, follows the general direction of the valley of the Shaker mill stream, or Stearns' brook, as it is also called, not falling upon the stream, however, until it reaches Robbins', $2\frac{1}{2}$ miles west of Pittsfield, and ascending at a grade of feet ; crossing Phelps' brook, the route turns gradually to the S. W. upon a curve of a mile radius, and encounters deep cutting upon land belonging to the Hancock Shakers. Still pursuing the valley of the Shaker mill stream, it ascends at a grade of feet to the summit in Richmond, near Rev. Mr. Dwight's. From thence it descends towards the Canaan gap, at an uniform grade of feet, and by a very direct course to Gates' furnace, crossing in its route, Beaver dam swamp ; from Gates' it curves gently into the valley of East brook, still descending feet per mile, and unites with the Hudson and Berkshire Rail Road at the State line, 62.62 miles from Connecticut river.

In addition to the above described main line, three others, together with various shorter lines, and making by their several connexions six distinct routes, were also surveyed between Dalton and Richmond ; from among these, the three lines above mentioned have been combined in such a manner as to present the most advantageous disposition.

The first is designated in the memoir as the C. line ; it diverges from the main line east of the Housatonic above Goodrich's, thence cutting off a bend of this stream, it follows the south side of the river, crossing it again at the brick factory, thence crossing the Pittsfield road $\frac{1}{2}$ a mile south of the village, thence turning farther west, it crosses the Pontoosuc and the Shaker mill stream, thence by the valley of this latter stream, and near K. Strong's, it unites with the main line between Robbins' and Phelps' brook ; length of this line about 5 miles, and the comparison with the main line will be thus exhibited :

Routes.	Length Miles.	Deflection Degrees.	Radius Min.	Grade Max.	Cost of Graduation.
Main Line.	26.76	755	28.65	44.88	538,875.07
South Line.	26.89	749	do.	do.	548,427.68
Differences.	0.13	6			9,552.61

Thus it appears that the south line is 700 feet the longest, costs 9,550 dollars more than the main line: in addition, it has 44.18 feet more rise and fall, and avoids the village of Pittsfield.

The next route in succession, is the Pond line; it diverges from the south route or C. line $1\frac{1}{4}$ miles west of the brick factory, and from thence it passes by a direct course to Richmond pond, and unites with the main line $1\frac{1}{2}$ miles west of the Richmond and Pittsfield boundary. The comparison would be

Routes.	Length Miles.	Deflection Degrees.	Radius Min.	Grade Max.	Cost of Graduation.
Main Line.	26.76	755	28 65	44.88	538,875.00
Pond Line.	26.19	717	do.	59.40	552,384.00
Differences.	0.57	38		14.52	13,509.00

It results from this, that the Pond route is upwards of $\frac{1}{2}$ a mile shorter than the main line and has 38 degrees less deflection; opposed to this, it has a grade of nearly 60 feet, (14.52 more than the main line,) and costs 13,509 dollars the most.

The next is called the Stearnsville line; it deflects from the main route about 2 miles west of Pittsfield, and turning further south crosses a bend of Shaker mill stream, thence by Stearns' factory village, thence cutting off two bends of the same stream, it crosses the northern point of Richmond pond, and re-unites with the main line one mile beyond the Richmond and Pittsfield boundary.—Comparisons.

Routes.	Length Miles.	Deflection Degrees.	Radius Min.	Grade Max.	Cost of Graduation.
Main Line.	26.76	755	2865	44.88	538,875.07
Stearnsville.	26.65	793	1910	do.	548,427.68
Differences.	0.11	38	955		9,552.61

Stearnsville line 580 feet shorter than main line, 38 degrees more curvature, 955 feet less radius at the minimum curve, cost 9,550 dollars the most.

By a resolution of the Board of 10th August, a line was directed to be surveyed to Hatch's gap in Richmond. This line deflects from the main route on the east side of the Richmond summit, and near the Pittsfield boundary line; it passes by a very direct and favorable route, through the village of Richmond, and ascends the gap, near Hatch's at a grade in no place exceeding 30.62 feet. Hatch's is 2.66

miles north of the Canaan gap ; compared with the main route to this latter point, it would afford the following results :

Routes.	Length Miles.	Deflection Degrees.	Radius Min.	Grade Max.	Cost of Graduation.
Main Line.	26.76	755	2865	44.88	538,875.07
Hatch's Gap.	24.39	706	1432	30.62	496,094.19
Differences.	2.37	49	1433	14.26	42,780.88

Finally, a line was located from the west side of the Richmond summit, to West Stockbridge village ; the following table will exhibit the results.

Routes.	Length Miles.	Deflection Degrees.	Radius Min.	Grade Max.	Cost of Graduation.
Main Line.	26.76	755	2865	44.88	538,875.07
W. Stockbridge.	26.76	934	1348	50.95	496,094.19
Differences.	0.00	179	1517	6.07	42,780.88

The distance from West Stockbridge village to the State line by the route of the West Stockbridge Rail Road is 2.66 miles.

In conclusion we annex the following table, exhibiting the general results furnished by the approximate location, and those of the final location.

Routes.	Length Miles.	Deflection Degrees.	Radius Min.	Grade Max.	Cost of Graduation.
Approx. Loc.	63.104	4441	764	82.19	1,259,100.87
Location.	62.622	3788	1042	78.98	1,394,830.13
Differences.	0.482	653	278	3.20	125,729.26

Thence it appears that by the final location the distance is reduced half a mile ; that the curvature is diminished 653 degrees or nearly one seventh of the whole amount ; that the minimum radius is extended from 764 feet to 1042 feet, and that the maximum grade upon the most difficult portion of the route, is reduced 3.20 feet per mile.

So many important and decided improvements, it may be supposed, from the thorough examinations which had been previously made, are not to be secured without a corresponding disadvantage. In this case, it is in the cost that the objection lies ; the estimates amounting as they do, to 125,700 dollars more by the location, than by the approximate line, or about 2000 more per mile upon the entire line west of the river.

It may be well to remark in this place, that we had inten-

ded, from the origin of our connection with this work, that the data for the estimates should be sufficiently ample in each case to cover the cost of construction, and to state that they had, thus far, in every instance been predicated upon the best information we could possess ourselves of. In pursuance of this principle of action, we think it proper to add that in the revision of the estimates for the construction of the more difficult portion of the work between Tekoa mountain and the Washington summit, a still further sum has been included, in making up the computations of the cost. We should be guilty of injustice to the corporation in whose service we are employed, as well as to ourselves, were we to omit communicating to the Board at every stage of the work, all the light which we may from time to time receive, even if by such communication, we subject ourselves to the imputation of having previously hazarded opinions upon the same points prematurely, conceiving that, if our statements are based upon the best information we possess, at the time they are made, they will, at least, be considered honest, and be received as such. When, therefore, we state the large difference in cost, which exists between the approximate and the final location, we would wish it to be borne in mind, that this difference does not depend entirely upon the change in the line, but that some portion of the excess is to be ascribed to the additional prices which we have affixed to the estimates at the rocky excavations between Tekoa mountain and the head of the long plane at M'Elwain's; for it will be remembered that if the estimates of the approximate line, were subjected to a revision upon the same data which were used in the computations of the final line, it would result in enhancing the estimated cost of that line also.

From Connecticut river to the Washington and Middlefield boundary line the final location was made by Mr. Childe, with Mr. Foster as assistant.

From the Washington line to the state boundary, and to West Stockbridge village, the location was made by Mr. I. C. Chesbrough, with Mr. Barton and Mr. Russell as assistants.

Appendix No. 1 contains Mr. Childe's descriptive memoir.

Appendix No. 2 contains Mr. Chesbrough's descriptive memoir.

Maps, No. 1 to 5, inclusive, contain the entire location

from Connecticut river to the state line on a scale of 12 inches to 1 mile, or $\frac{1}{82.5}$.

Profiles, 1 & 2, contain profiles of the same, on a scale of like size.

Map No. 3, is the location of the Rail Road at the point of Tekoa mountain, on an enlarged scale.

Profile No. 3, is the Westfield village line.

Profiles, 4, 5, 6, 7 and 8, contain the several lines through Pittsfield, Richmond, West Stockbridge, &c. on scales of 12 inches to the mile.

Table A. contains a synopsis of the location from Connecticut river to the Washington boundary line, exhibiting the details of the route, distances, ascents, descents, cutting, fillings, masonry, bridges, estimated cost, &c.

Table B. contains the length of each curve together with its corresponding radius, between the two points above mentioned.

Table C. contains the comparisons of various routes and parts of routes as above.

Table D. is the Synopsis of the location from Washington to the state line, including the West Stockbridge, Hatch's gap, and other lines, together with table of curves, &c.

Respectfully submitted,

W. H. SWIFT.

On examination of this report we concur in the opinions therein expressed.

WM. GIBBS McNEILL,
G. W. WHISTLER.

APPENDIX NO. I.

Springfield, March 15, 1838.

TO CAPT. W. H. SWIFT, ENGINEER OF THE WESTERN
RAIL ROAD.

SIR,

Herewith you will receive Maps and Profiles of the final location of the Western Rail Road from Connecticut River to Washington; also Tables A. B. & C. which exhibit the results of the survey and the estimated cost of grading and bridging for a single track, with the exception of about two miles at several points where the nature of the work renders it expedient to grade at once for a double track.

From the Springfield Depot the line is continued straight to the west side of the river; thence by a $1\frac{1}{2}$ degree curve it takes the direction to Ashley's Mill, where it strikes the north bank of Westfield River.

This bank on the length of 18 chains is exceedingly broken; but the line is laid sufficiently deep to secure a firm road bed. To avoid encroaching on the mill, and to equalize as far as may be, the cuttings and fillings immediately above the mill without adopting a curvature greater than 2° , the embankment between Stations 112 and 116 must be supported on the river side by a wall, stone for which will be taken from the cuts above and below.

Across the table land owned by the Midneag Canal Co., which is the proposed site for their village, the line is straight or of easy curvature, passing through the shanty, above which it takes the north bank of the factory canal where the road may be safely constructed by introducing a support wall between Stations 150 and 153. The stone for this will be supplied from the cut at the dam, distant only 300 feet. The line is laid as near the canal as possible with-

out diminishing its capacity, for the purpose of greatly reducing the excavations, nearly all of which are to be wasted.

From the Midneag dam the line retains a suitable height upon the side hill, and reaches the turning of Tatham hill by a succession of curves of 2, $2\frac{1}{2}$, and 3 degrees. Several culverts are required between Ashley's mill and the latter point, and the cuts will supply stone for them all. That at Block brook is proposed to be a rubble arch of 12 feet span.

The line doubles Tatham hill by a $4\frac{1}{2}^\circ$ curve, the length of which is 30 chains. It does not seem advisable to reduce this curve by increasing the cutting, because it is expedient to have the grade here horizontal, which leaves the effective power of the engine much greater upon the present curve than it can be upon the two preceding grades.

Of the two lines approximately located from Tatham hill to near Morley's bridge, that which passes near Wm. Sibley's has been taken for the final location. As was shown by the approximate estimates, it will cost \$24,822 more than the other, which runs nearer the river, and is represented on the map by a blue line, but is preferable to that in other respects. The Springfield road at Sibley's must be cut down 7 feet to a level with the Rail Road; the houses of A. Miller and Mrs. Taylor must be moved; the two roads over Grave Yard hill may be turned back of T. Taylor's as indicated on the map by dotted lines.

A bridge of 12 feet span is proposed at Meadow brook, instead of a culvert, for the purpose of bringing the grade as low as possible. The estimate includes the cost of a tunnel 225 feet long in Grave Yard hill. This length rests on the assumption that the hill to this extent is solid rock from the top, and that tunneling, where arches are not needed, will not cost more than an open cut 40 feet deep. This cut will average 48 feet deep on the assumed length of the tunnel; consequently the amount saved by it cannot exceed \$3,000.

The project of a tunnel is set aside however, by the fact that without a tunnel the cut will furnish for the embankment across Pawcatuck valley 12,000 cubic yards of material more than with it, which obviates borrowing earth to the same amount; and the saving in this, as near as can be ascertained, will balance the \$3,000 which has already been stated in favor of the tunnel.

The highest point of this embankment is 26 feet. A rub-

ble arched culvert, 12 feet span, is proposed for crossing Pawcatuck brook.

The Springfield road may be turned between Stations 293 and 299, and kept on the south side of the embankment. The road by D. Smith's must pass under the Rail Road, or be turned to the right towards King's tavern, and cross on a level. The estimate includes the cost of a bridge keeping the road where it is.

The cut of 25 feet east of King's tavern is sand and gravel, and will be carried to the Pawcatuck embankment. From Miller's to King's are two curves of $2\frac{1}{2}^\circ$ and 3° separated by a tangent. It will be necessary to move King's tavern house 25 feet north, and keep the Springfield road from the bridge towards Noble's between the Rail Road and the river. From Springfield depot to King's there are six grades—one level, two descending, and three ascending west.

Maximum ascent per mile, 33.58 feet.

Do. descent do. 9.8736 "

The first descending grade is across Connecticut river bridge and W. Springfield meadows, the latter requiring a heavy embankment, which may be reduced by lowering the east end of this grade and the level of the depot from two to three feet. This change is suggested.

From Station 351 three routes are presented through the Westfield valley.—1st, the north or "L" route bears to the right by $1\frac{1}{2}^\circ$ and 2° curves, passing in front of Harrison's and crossing Frog-hole brook by a bridge of 35 feet span; enters upon the meadows where about 73,000 yards of embankment are needed before reaching the Hampden and Hampshire canal, which will be crossed by a draw-bridge in the vicinity of the widow Merrick's. From this point the line takes favorable ground till it strikes the canal feeder; requiring no curvature greater than 2° , and but one culvert of any magnitude, which is at the crossing of Montgomery brook near Mrs. Bancroft's, and to be covered with a rubble arch 12 feet span.

Buildings to be moved are the wing of Roger's tavern, two shops and a small house near by, Coburn's and Pratt's barns, a school house near Woolworth's and Tinker's saw-mill.

The line is in contact with the feeder 60 chains, crossing it three times, and requiring the left track to be laid over it on

the distance of 275 feet. For most of this distance, however, the line is traced on the feeder bank, which must be straightened and widened by several alterations of the trunk of the feeder, all of which are exhibited on the accompanying map No. 3.

The estimate includes the cost of grading these 60 chains for a double track, placing the road high enough above the water of the feeder to allow scows to pass under.

At the point of Tekoa mountain where the feeder passes under the road, a stone aqueduct is estimated for, requiring 807 perches of hydraulic masonry, and 1548 perches of foundation and supporting wall; the latter where the earth has been washed from the base of the hill by former breaks of the wooden aqueduct.

Suitable stone for nearly all this work will be taken from the cut at the point itself, and \$300 are added for preparing the foundations. Fifty-four chains of the above 60 are taken up by six curves from 2° to $4\frac{1}{2}^{\circ}$. After confining the water of the feeder by this plan of construction, there does not appear any reason for doubting the permanency of the road bed. The only risk, then, of injury from a feeder break will be incurred between Tinker's and Woolworth's, a distance of 23 chains. But here a break has not occurred for the last three years, and a small expenditure will strengthen this bank so that another shall not occur. From widow Palmer's the line gradually leaves the feeder by a curve of 2° to the right, passing half way between Bronson's house and barn, where the cutting is 11 feet, permitting a frame bridge over the Rail Road; thence it takes good ground by Bishop's to Station 781, where the grade of this and the Village route No. 1, become the same.

Going back to Station 351, the 2d or Village route No. 1, is found represented on the map by a black line as it was approximately located. Several slight changes which would be effected by a final location are also dotted in black. It crosses the Springfield road in front of P. Alderman's, and the Great river back of Harrison's by a bridge 180 feet span, 25 feet above low water; thence it passes over favorable ground by W. Ingersol's to the best point for crossing Little river, which is done by a bridge 134 feet span, 14 feet above low water; thence it takes good ground by L. Bush's, passing back of Col. Root's barn to the Hampden and Hampshire

canal, which is crossed by a draw-bridge ; thence it crosses Broad street nearly on a level, between Jessup's on the north and J. Bush's on the south ; thence to Court street, which is crossed on a level ; thence by 1° curves it takes the most favorable ground by W. Phelps' to the bank of the river above Newton's tavern, along which it continues to within 11 chains of Clark's tavern, where it runs into the bank, cutting off the water from a turning shop ; thence passing over low ground back of widow Sackett's by a 3° curve it again runs into the bank, which it follows by cutting through a rocky spur at Station 718, passing a deep ravine at Station 722, and undermining Wheaton's house, beyond which it gradually falls from the hill side and takes the direction of widow Palmer's over the only possible place for crossing the river. This crossing is effected by a bridge of 168 feet span, 56 feet above low water, resting on stone abutments. The embankments here exceed 178,000 yards, $\frac{3}{4}$ of which is to be borrowed from the hill above and east of the canal feeder. Passing the road at widow Palmer's by a bridge, the line soon comes upon the feeder bank, which it follows to the point of crossing the feeder ; thence it passes close to Bronson's house, (which may be moved to the east) and coincides with "L" route until the grades unite at Station 794, which is the same as 781 "L".—Buildings to be moved are the houses of L. Bush, Williams, Weller, Shepherd, Curtis, Wheaton, and Bronson ; also the barns of Col. Root, Newton, widow Palmer, and Curtis, and the turning shop at Clark's tavern. The 3d or Village route No. 2, is formed by taking No. 1 from Station 351 to Station 517 west of the village, from which point it is represented on the map by a blue line. Passing over favorable ground it crosses the Albany turnpike at D. Smith's, and by $1\frac{1}{4}^{\circ}$ curve strikes the best point for crossing Great river, which is effected by a bridge of 185 feet span, 22 feet above low water. The south bank here is very unstable and will require protection on the length of 700 feet above the crossing ; for which purpose \$1500 are included in the estimate. From the river the line may be straight, but requires a heavy embankment to Pratt's house, near which it will join the "L" route, already described, which it follows (for the purpose of comparison) to Station 780, which is the same as 781 "L", or 794 of No. 1.

Buildings to be moved are the houses of L. Bush, Wil-

liams, Weller, and widow Shepherd ; the barns of Col. Root, Tinker, and Pratt ; also a school house near Woolworth's and Tinker's saw mill.

The results of these three routes are as follows :—

Routes.	Str't Line	Cur'd Line	Total Le'th	Shortest Curves		Total Deflec- tion	Max. Le'th	Grade. Rise per M.	Total ascent of G'de Feet.	Cost of River Bridges.	Total cost Grading and Bridging.	Cost per Mile.
	Feet.	Feet.	Feet.	Rad. Feet	L'th Ft		Feet.	Feet.				
L. Route.	30.077	32.923	43.000	1273 $\frac{1}{3}$	950	433°53'	12.300	33.264	124.930		\$89,745.40	11,019
No. 1.												
W. V. R.	21.642	22.658	44.300	1273 $\frac{1}{3}$	2600	408 27	13.600	31.0464	124.930	32,627.60	130,472.59	15,650
No. 2.												
W. V. R.	24 593	18.307	42.900	1273 $\frac{1}{3}$	950	380	12.000	34.545	124.930	23,483.60	103,808.30	12,776

Remark.—The dotted line from 528 to 632 would be the final location, though not without a moderate increase of cost. It will shorten the route 200 feet, and diminish the curvature 76°.

For other details see table C. It is believed the village of Westfield cannot be passed better than by the line described, yet any change that may hereafter be made will not materially affect the above comparison.

In order apparently to induce the adoption of the village route, much has been said to prove that the required embankment upon the north Route from Frog-hole brook to River hole cannot withstand the force of the flood currents that sweep across the Meadow.

To settle this question it is only necessary to examine the map, and say in explanation, that the Westfield valley is a basin, into which the mountain streams pour their waters faster than the narrow pass at Morley's bridge will give them egress ; they consequently accumulate in the lower part of the valley to a considerable depth, checking rather than accelerating the natural current of the stream from which the line is entirely removed. The water of course continues to rise upon the meadows until the influx is reduced to the capacity of the outlet, after which they sink away as gradually as they had arisen. The effect is the same as would be experienced if, when the influx reaches, but does not exceed the capacity of the outlet, a dam were raised inch by inch at Morley's bridge until the water reaches the height of the highest flood and immediately lowered in the same manner.

When at the highest it appears that the water must be quite still, excepting in the natural channel and the agitation of the surface by wind ; and when falling it must move gradually and in mass towards the outlet *from*, it may

be remarked, and not *against* the proposed embankment. It is also well known that these meadows receive their enrichment as much from detritus deposited upon them by floods, as do the banks of the Nile. This indeed constitutes their chief value, and precludes the existence of any currents sufficiently strong to break the turf of the embankment, the road surface of which is laid $\frac{1}{2}$ a foot above the highest authentic flood mark.

Finally, three objections may be stated against the North Route.—Greater exposure to floods, distant $\frac{1}{3}$ of a mile from Westfield village, and contact with the canal feeder. As an off-set to which, the village Route No. 1, presents an extra estimated cost of \$40,727, 503 feet more bridging, and 1300 feet greater length.—Compared with the village Route No. 2, the 3d and chief objection is common to both. The first and second, then, will be weighed against the latter route, which has 500 feet more bridging, and a greater estimated cost of \$14,062, the length being 100 feet less.

The maximum grades are,

V. R. No. 1. — 31.046.

L. Route — 33.264.

V. R. No. 2. — 34.545.

The 1st is $4\frac{7}{10}$ per cent. of effective motive power better than the 2d.

The 2d is $2\frac{4}{10}$ per cent. do. better than the 3d.

Continued from Station 781 the location proceeds by easy curves along the base of the mountain, cutting deep enough from station 796 to 803 to form $\frac{1}{3}$ of the embankment across the bed of the river above; the remaining $\frac{1}{3}$ may be brought from the cut at Bronson's. Two curves were approximately located across this bend of 7 and $5\frac{1}{2}$ degrees; the 2d was estimated to cost \$6,670 more than the 1st. The present location is by a 5 degree curve, throwing the road farther from the shore, by which we gain more from a knoll in the pond, which was once an island but now submerged. There will be rock enough in the cuts loose and solid to carry the outer half of this embankment to a level above highest water. At Station 822 is a small stream which must be cut down and passed under the road.

The changes made between Stations 820 and 862 from the approximate location result in an increase of rock cutting of 5500 yards, and a reduction of curvature of 110 degrees; the maximum curve, being reduced from $7\frac{1}{2}$ to 5 degrees. Rapid brook will be turned below Station 844, and

crossed by an open culvert, 6 feet wide, at Station 850. The rock from the cuts at Shatterack mountain, and Rattle-snake hill, will be used in building into the river above and below.

The embankment on Finney's flat will be supplied from a high gravel bank through which the line passes by a curve of $2\frac{1}{2}$ degrees to the Narrow's, where a ledge of gneiss nearly of the consistency of granite, breaks the course of the river. The highest points of this ledge are 20 feet above low water, yet the floods rise three to four feet higher. The bridge here is proposed of 2 spans 135 and 80 feet, separated by 60 feet of solid road-way, and connected with the shores by walls and embankments. At Station 887 the line crosses Russel brook, over which a bridge is proposed 85 feet long; about 20 feet of this is for the purpose of reaching the natural rock which will form the west abutment.

From the narrows a 3 degree curve to the right brings the line to the base of Tuttle mountain, along which it pursues a direct course to Tuttle bend, where the river will be crossed by a bridge of 2 spans 130 feet each, and 33 feet above low water. Two curves from Station $928\frac{1}{2}$ to $961\frac{1}{2}$ were approximately 6 and $6\frac{1}{2}$ degrees, but are now reduced to $5\frac{1}{2}$ degrees by additional cutting at the opposite points. They are the shortest on the Route, and cannot be further reduced without excessive cost. The cut from Station 946 to $961\frac{1}{2}$ will furnish stone for the bridge at the bend and for a river wall at Station 963, where the line after leaving the cut passes under a perpendicular rock bluff, at the foot of which is a narrow table land 20 feet below grade, terminating in a rocky shore. From this point the line continues on good ground by 4, 3, and 1 degree curves joined by straight lines to Station 1010,82, crossing a small brook on the way, for which a rubble arched culvert 6 feet span is proposed.

It will be recollected that two lines were approximately located from below Gould's mill to Chester village, and that a preference was given to the south side of the river, the line crossing below the mill, although the estimated cost was \$5,899 greater than the north side. After a more thorough examination, however, it was found that there would be over 3000 yds. more of rock cutting at Gould's mill than was anticipated by the approximate estimate; this added to the former balance gave over \$9000 in favor of the north side; accordingly the location was continued upon that side.

Passing from 1010,82 by a 4 degree curve through a heavy rock cut opposite the mill (all of which will be used in bank walls below, and in a bridge over Taylor's brook above), the line strikes around Rock House mountain, by a 2 degree curve, passing over very favorable ground, and through H. Lindsey's barn and orchard, beyond which it enters a high gravel bank flanked on the west by a rock spur of the mountain. From this spur, stone may be obtained for a bridge over the "north branch" which will be of 2 spans, 130 feet each, and 25 feet above low water. From the bridge the line passes through the point of Rabbit knoll, following the outer verge of a narrow table land to Station 1096, thence by a $2\frac{1}{2}$ degree curve it crosses the Norwich road on a level, and the river 15 feet above low water by a bridge 130 feet span, which will be located over the old channel at Station 1099; the present channel being closed by the embankment which must be revetted with stone on the north side. From the river the line passes through Rice's barn, and by $1\frac{1}{4}$ degree curve takes the most suitable ground to Station 1131,28. Up to this point from Station 1004,82 below Gould's mill, the results are compared with those of the approximate line on the south side, and are as follows :

	Total length feet.	Total deflec- tion.	Grade pr. mile feet.	Tot. asc't feet.	Rd. of shortest curve, feet	Total cost.	Cost per mile.
L. Route.	12.646	246° 2'	25.054	60	14324	\$41.922	\$17.503
Approx. Do. }	12 212	260° 30'	28.535	66	1528	\$49.180	\$21.263
South Side. }							

Giving for the north side \$7259 less cost, $14\frac{1}{2}$ degrees less curvature, and a more favorable grade, occasioned partly by its greater length of 434 feet. Contact with the turnpike 28 chains is a serious objection to the south side. The approximate lines are represented on the map by black lines. For the details of this comparison see table "C."

A depot may be fixed at the village between Stations 1103 and 1108, or on the other side of the river east of the Norwich road.

From Station 1131,28, the line by a two degree curve crosses the short bend of the river, and by straight lines and gentle curves reaches Mountain brook. The greater part of the work in this distance is to turn the river at the bend, between the lines dotted on the map, near the turnpike

road where it once evidently ran, and to guard the embankments by rip-rap walls at three other points where the line encounters short turns of the river.

Mountain brook is sometimes dry, but in heavy rains rises 5 and 6 feet, carrying down the mountain large rocks, and every thing else that obstructs its course. These rocks with gravel have been lodged at the mouth of the brook until its bed and banks are raised much above the adjacent meadows. Accordingly, to preserve an uniform grade from Chester village to the next stopping place, it (the grade) must pass 5 feet below the bed of the brook and 9 feet above low water in the river. It therefore becomes necessary to sink the former nearly to a level with the latter in order to furnish a safe vent under the road. The cost of this is included in the estimate. The difficulty of keeping this vent unclogged is a question for future consideration. From the brook the line by $3\frac{1}{2}$ and $3\frac{3}{10}$ degree curves, and short tangents takes the most favorable ground between the river and mountain through Sisk's barn to Station 1300.

The only serious obstacle from Chester village to this point is Mountain brook; and to avoid that, another line has been located from Station 1185.30 to Station 1274.10 passing by Osborn's and crossing the river twice by bridges 130 and 150 feet spans and 14 feet above low water. This line is straighter, and 478 feet shorter than the other. The obliquity of the upper crossing is the strongest objection to it; and in order to pass the river at Station 1238 the grade from Chester village to that point must be 35.112 feet per mile, 1.37 feet per mile more than on the other side. The results of these routes from the village where the grades separate to Station 1300 where they again unite, are as follows:

	Total length, feet	Total deflection.	Grade per mile feet	Total ascent feet	Rd. of shortest curve feet.	Total Cost.	Cost per mile.
L. Route	19200	325°57'	33.264	120.96	1528	\$25.786	\$7.091
A. " via. } Osborn's }	18722	233°02'	{ 35.112 31.786	120.96	1848- $3\frac{3}{10}$	\$34.675	\$9.779

Giving $95^{\circ}55'$ curvature in favor of the Osborne line, and a greater cost of \$8,889 against it.—See table "C."

Two lines have also been located from Station 1309.45 to 1394.05.—1st "L" route, which passes by $1\frac{1}{2}$ degree curve to the right of Sanderson's barn, crosses the brook by

a bridge of 25 feet span, and the meadow in front of Knox's house by an embankment averaging 10 feet in height to the river at Johnson's, where it crosses 16 feet above low water by a bridge 115 feet span; thence it takes very favorable ground to Willcox's mill pond crossing flood brook on the way by a double culvert. The mill pond is crossed by a bridge of two spans 90 feet each, and 13 to 14 feet above low water; thence crossing the meadow the line strikes the bank at Smith's house, crossing the turnpike nearly on a level at the Gimblet factory, and passing back of the school house through a gravel knoll, reaches Station 1394.05.

2d. "S" route, which, passing through Sanderson's barn, crosses the brook and east part of the meadow, then the turnpike at Knox's house, beyond which it keeps sufficiently high ground till it strikes the first bend of the river, which is passed by an embankment faced with wall, after which the turnpike is occupied $5\frac{1}{2}$ chains by cutting it down 17 feet in the deepest place, and moving it towards the river. Leaving the turnpike, the line passes a rock ledge at Station 1351, and another of the same description beyond the road leading to Willcox's mill; thence by two crossings of the turnpike, between which the road must again be built into the river, it passes upon Arnold's meadow, from which it crosses two gravel knolls and joins the location at 1394.05. The results of these routes are as follows:

Routes.	Total length Feet.	Total def'nion degr's.	Grade per m. Feet.	Total ascent Feet.	Rad. of shortest curveft.	Total Cost.	Cost per Mile.
L. Route.	8460	83°16'	33.264	53.267	3439.37	\$21,799	\$13,606
S. do. via Knox.	9035	174 09	31.153	53.070	2022	26,919	15,732

Differences in favor of "L" route, length 575 feet, curvature 91 degrees, and cost \$5,119.50. Difference of grades, 2.11 feet per mile, in favor of "S" route, on account of its greater length. Contact with the turnpike is another objection to "S" route. For other particulars, see table C.

There are no grades between Connecticut river and Station 1394 of greater inclination than $33\frac{1}{2}$ feet per mile; but in order to cross the river above Dewey's, the grade must rise more rapidly from the latter point. But it is important to have a stopping place where additional power may be applied before encountering a greater inclination, and also

desirable to fix it as far west as practicable: accordingly, a short grade has been introduced at A. Smith's, at the junction of Becket road with the turnpike, which satisfies the above conditions more fully than they can be at any other point. From this stopping place the line passes by easy curves and straight lines to Sta. 1536, at the base of Serpentine mountain, ascending by three grades respectively, 52.8, 49.47 and 68.11 feet per mile. In this distance the line crosses the river three times; 1st above Dewey's by a bridge 125 feet span and 14 feet above low water,—2d above Fay's mill by a bridge 115 feet span and $14\frac{1}{2}$ feet above low water,—and 3d, at the base of Serpentine mountain by a bridge 80 feet span, and 26 feet above low water. At S. Snow's the road will be built across the bend of the river, requiring the bridge of Chester road and the river to be moved to the left by cutting through the point of low ground opposite. There are small rock cuts at Stations 1452, 1474 and at D. Bigelow's.

At Station 1536 commences the Pontoosuc grade, which ascends at the rate of 78.988 feet per mile to Station 1874, above M'Elwain's tavern, a distance of 6.4 miles, in which the river is crossed 14 times, occasioning a vast quantity of heavy work. Commencing at the foot of the grade, the line passes along the base of Serpentine mountain by a $\frac{3}{4}$ degree curve, giving sufficient cutting of rock and loose rock for the bridges and bank walls above and below.

The Middlefield road is crossed on a level, beyond which, at Station 1562 $\frac{1}{2}$, begins a $4\frac{1}{2}$ degree curve, which passes to the left through Rhinosceros point to Station 1601 $\frac{1}{2}$, crossing the river at Station 1568 $\frac{1}{2}$ by a bridge 140 feet long 30 feet above low water, and again at Station 1580 by a bridge 60 feet span and 37 feet above low water. At the first crossing is an embankment of 52,382 yds. $\frac{3}{4}$ of which must be borrowed earth.

The cut at Rhinosceros point is light, but all rock; the next above is chiefly gravel. From Station 1601 $\frac{1}{2}$ a tangent of $5\frac{3}{4}$ chains joins the preceding curve to another of equal degree which extends to the right around the point of Walnut hill to Station 1631.40, where it changes to four degrees and continues to Station 1642.40. At Station 1643.15 begins another curve to the left of $3\frac{1}{2}$ degrees, extending across the river to Station 1657.40, whence a straight line runs across the river and reaches Leech's brook by a three degree

curve. At Station 1602 the river is crossed by a bridge 120 feet span, and 52 feet above low water, resting on stone abutments. The embankment here is 97,682 yds. 40,000 of which will be of borrowed earth. The cut between Stations 1612 and 1620 is apparently all gravel, yet judging from the character of the country, rock may be found in it.

The crossings at Stations 1650, 1621, and 1661 are formidable, the 1st 70, the others 60 feet each above low water.

With ordinary facilities for obtaining earth for embankments and materials for bridging, it is believed that the former may be constructed to the height of 60 feet on lengths of 200 feet and upwards as cheaply as the latter without considering their superiority afterwards, and on lengths below 200 feet for less cost; but at these three crossings earth cannot be obtained, the contiguous cuts being entirely of rock as are also the mountains on both sides of the river. It follows then that the embankments to whatever extent they may be carried (the limits to be determined by a minute survey of each locality,) must be composed chiefly of rock from the cuts and loose rock from the surface of the hills, and the remaining distances supplied with wooden bridges resting on stone piers and abutments, or (to obviate so great a length of wood structure) by a combination of bridges and stone work, the latter either solid like the Canton Viaduct, or open in the form of cobble work as roughly exhibited on sheet No. 4. The bridges being long enough to span the river and turnpike, and the stone work connecting them with the embankments on either side.

From a rough calculation, it appears that the cost of the three modes here suggested, as applied at the most difficult of these crossings (that is, at Station 1650) will be (taken in the order mentioned above) in the ratio of the numbers 1, $1\frac{1}{2}$ and $1\frac{1}{3}$. Some details of the mode of construction last suggested, with the course of the river at Station 1650, and the character of its banks will be seen on sheet No. 4, before referred to. Believing that suitable stone may be easily obtained for cobble masonry, the estimate has been made to embrace the probable cost of it at the three crossings in question for all heights over 38 feet excepting the space occupied in each case by the bridge.

At Station 1628 will be 1696 perches of support wall

under the left track ; thence the line passes through the point of the hill giving 40,374 yards of rock cutting, on a base of 20 feet, and 50,102 yards on a base of 30 feet. 23,809 of the first, and 29,508 of the second will be avoided by a tunnel 335 feet long.

The estimate includes the cost of this tunnel at \$60 per running foot. The cut at 1658 is all rock ; that at 1670 chiefly earth and loose rock, all of which will be needed for embankment between Stations 1663 and 1680. It may be remarked, however, that this as well as some other embankments into which a large amount of rock will be put, may be considerably diminished by placing the rock on the sides, forming rip-rap slope.

At Station 1680, Leech's brook and Middlefield road will be crossed by one bridge 50 feet span and 40 feet above low water ; thence by 3, 2, and 4 degree curves, separated by short tangents, the line takes the most feasible ground to Station 1730.10, giving cutting enough between Stations 1694 and 1706 to supply the filling west of Leech's brook. The filling at 1713 will be kept out of the turnpike by a rip-rap wall.

From 1730.10 the line passes by $4\frac{1}{2}$ degree curves to Sta. 1758 $\frac{1}{2}$, crossing the river 3 times and cutting through opposite points to the depth of 50 and 55 feet, where tunnels are projected 280 and 140 feet in length, avoiding by both the excavation of 18,317 yds. of rock and 2,816 yds. of loose rock, on the base of 20 feet, and 25,324 yds. of rock and 4,088 yds. of loose rock on the base of 30 feet, costing rather more on the lesser base than open cuts, but \$10,741 less than open cuts on the greater base. It appears that cuts 22 feet wide at the base through these narrow spurs of rock will be sufficiently wide for a double track, accordingly the use of tunnels here becomes of doubtful expediency, certainly not to the length projected. The crossings at Stations 1735, 1746 and 1755 will be effected by bridges, respectively 155, 75 and 50 ft. span, and 46, 35 and 25 feet above low water, all resting on stone supports. From Sta. 1758 $\frac{1}{2}$ the line passes in a direct course over favorable ground by gentle curves and short tangents to Sta. 1859 $\frac{1}{2}$ near M'Elwain's ; thence by a $2\frac{3}{4}$ degree curve it turns 92° to the north, and by a short curve of $1\frac{1}{2}$ degrees joins Mr. Chesbrough's location in Washington at Sta. 1902.57. The stream will be

crossed in this distance 7 times, at Station 1762½, 1811, 1824, 1843½, 1865, 1884 and 1900; length of bridges respectively 85, 55, 60, 50, 75, 25 and 30 feet, and above low water (in the same order) 22, 16, 13, 12, 7, 8, and 11 feet. To avoid frequent crossings of the turnpike from Champlin's saw mill to M'Elwain's, it may be easily turned and kept on the right of the Rail Road as indicated on the map by dotted lines. At all other points of intersection it will be banked over the Rail Road, or passed under the river bridges. M'Elwain's and Cook's ponds must be taken away, or the road must be guarded from their flood waters by dikes. In case the latter should be deemed sufficient, M'Elwain's dam may be moved out of the way and rebuilt on the dotted line "A." A short dike will be required from Station 1862½ to the bridge, to guard the road from the water of Becket brook, which in high freshets flows down the meadow east of the turning shop. A new channel will also be dug from Cook's dam to Station 1884, the earth from which will form the adjacent embankments. From the head of the steep grade at Station 1874, to Station 1880 is a grade 600 feet long, forming a suitable stopping place.

By recurring to the approximate location it will be seen that the principal change in this part of the Route is in making the grade of uniform ascent from Station 1536 to Station 1874, by which the maximum ascent per mile is reduced from 82.18 to 78.988 feet; less 3.192 feet per mile, which is equal to 3½ per cent. of the effective motive power, or the addition of 1.638 tons to each load of a single Engine. It will also be seen that the curve around Rhinoceros Point is reduced from 996½ feet radius to 1348½ feet. This curve cannot be farther reduced, therefore it has not been exceeded at any other point on this steep grade, although shorter curves at Walnut and Beech hills would greatly reduce the cost of those cuts. The only important changes of the tracé are between Serpentine mountain and the junction of Becket road with the turnpike; and although 4 crossings of the river are avoided in this distance, yet on account of greater obliquity of some of the crossings and the greater lengths required to pass the turnpike, the total amount of bridging on the whole route is but 3 feet less than on the approximate location, by which the closing of the Pontoosuc turnpike was contemplated. By table "A" the estimated cost from Con-

necticut river to the foot of the Pontoosuc grade is \$16,803.37 per mile, distance 28.9191 miles; and from the latter point to the end of the line at Station 1902.57 \$51,856.87 per mile, distance 6.9425 miles. The total cost including Conn. river bridge, is \$845,955.06, giving an average per mile on the whole distance of \$23,588.52. This is considerably more than the approximate estimate, the results of which are attached to tables "A" and "B" exhibiting at one view the differences of the two estimates.

In favor of the final location we have a reduction of maximum grade 3.192 feet per mile.

A reduction of curvature 449 degrees.

A reduction of distance 1630 feet.

A reduction of several curves from $7\frac{1}{2}$, 7, $6\frac{1}{2}$, 6 and $5\frac{1}{2}$ degrees to 5, $5\frac{1}{2}$, and $4\frac{1}{2}$ degrees and nearly all reversed curves avoided by introducing tangents. Against these improvements

stand, 54.443 yds. rock cutting	\$61,237
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39.848 do. loose rock do.	\$23,908
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Cobble Stone work	\$45,408
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Foundations, moving buildings and turning roads, not before estimated.	\$23,733
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Excess of Embankment	\$37,975
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Difference of estimates	\$192,261
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The grades are as uniform and as gentle in their ascent west as they can be; and as now arranged an Engine that draws 260 tons on a level will take 87 tons from Connecticut river to the stopping place at A. Smith's and 42 tons from thence to the summit. Several slight changes are suggested by the present estimate tending to a farther improvement of the line or to a reduction of cost.

Respectfully Yours,

JOHN CHILDE.

To CAPT. W. H. SWIFT.

SIR,

In addition to the foregoing statement a comparison has been made as you requested, of the final and approximate locations through the Pontoosuc valley, between Stations

1536 and 1874, distance 6.40115 miles, the length of the steep grade, the details of which are attached to the bottom of Table C.—The results are as follows:

	Total length feet.	Total deflection.	Shortest radius feet.	Inclination of grades per mile, feet.	Total ascent, feet.	Total cost.	Cost per mile
L. Route.	33,900	787	1345.98	78.988	605.6	\$324,499	58,377
A. Location	34,125	665	996.5	{ 71.37 52.77 81.71 77.30 82.18	605.5	301,491	47,058
Differences.	325	122	349.38			53,008	8,319

In favor of "L" route, 325 feet less distance, 349.38 feet longer minimum radius, and maximum grade 3.192 feet less ascent per mile. Against which are 122° more curvature, and \$53,008 greater cost.

It will be seen on the map that the greater part of this excess of curvature, is occasioned by keeping on the north side of the river from below Mann's Factory to the Becket road, where the line must remain in order to preserve the uniform grade, but none of it is equal in degree to what is indispensable at Rhinoceros Point, Walnut and Beech hills. To show the advantage of the above reduction of grade, it may be remarked that the load of one Engine from Springfield to the depot at A. Smith's in Chester, will be three tons more than two loads for the same Engine thence to the depot at M'Elwain's. On the supposition that only two loads will leave Springfield daily for the West, which after throwing off 3 tons more of way-freight than may be taken on, will form four loads over the mountain, we shall save $4 \times 1.638 = 6.552$ tons per day; and in a year 2050 tons. Assuming the freight charge from A. Smith's to Pittsfield, 25 miles, to be \$2.00 per ton (which is 38 per cent. lower than the present charges by Rail-roads from Boston to Worcester, considering the power to be used in both cases,) we have $2 \times 2050 = \$4100$ greater income per annum; \$920 more than the annual interest on the difference of cost. Another consideration of equal or greater importance is the increased rapidity with which passenger trains will ascend the mountain.

Very Respectfully,
JOHN CHILDE.

Springfield, March 17, 1836.

APPENDIX NO. II.

Springfield, March 15th, 1838.

**TO CAPT. W. H. SWIFT, ENGINEER OF THE WESTERN
RAIL ROAD.**

SIR,

Herewith are submitted the Maps and Profiles of surveys and locations made west of Station 2016½ of Mr. Childe's approximate location of the Northern Route for the Western Rail Road, since the 6th of last July.

Commencing at Station 2016½,—the zero point of these surveys,—a line has been located upon the general route of the approximate location to Mud brook, (a distance of 3½ miles), from which point, with the exception of crossing Mud Pond differently, it pursues the route designated by the dotted line upon the map of approximate location, to Capt. I. White's, Station 295 of location, 2318½ of approximate. The located line between Mud brook and I. White's is 700 feet shorter than the approximate, gives 110° less curvature, shortest radius 2865 feet, by approximate location 1432 feet, reduces the summit 7 feet, reduces the inclination of the summit planes 5 feet per mile, and, taking into consideration the diminished length of the rail-way, masonry and land damages, will cost less.

From Capt. White's to near Rufus Watkins' the located line is thrown more into the meadow, and by a 1½° curve intersects the approximate line opposite Watkins' house, (2351½ of approximate location.) From Watkins' to the Pittsfield and Dalton line, locations were made upon two routes. The 1st or continuation of what is assumed as the main line pursues nearly a direct course from Watkins' to Station 2446 of approximate location, passing the right of Hinsdale factories, and crossing the river four times. From Station 2446 (420

of location) it pursues the general route of approximate location, to West Street, (Mrs. Child's) in Pittsfield, the termination of Mr. Childe's line. The 2d or river route marked "R" line upon the map, follows nearly upon the track of approximate location to within $\frac{1}{4}$ mile of Plunket's dam, then leaving the approximate, it crosses Plunket's dam about 225 feet from the breast, and by a direct line passes 15 feet to the right of the Hinsdale Manufacturing Co.'s store, and crosses the grist-mill dam, about 225 feet from the breast; it then follows the valley of the river to Station 503 $\frac{1}{2}$, which is within a few feet of Station 490 of main line, the river route being 1400 feet longer. From 503 $\frac{1}{2}$ or 490 the lines follow the same mountain side, being separated by the difference of inclination only, to their intersection at Station 610 of main line opposite H. Porter's and near the boundary line of Dalton and Pittsfield. From their intersection to West Street, the main line is the only one located.

The advantage in direction gained by the main line between Watkins' and Station 2446 of approximate location will not compensate for its increased cost, and inclination. See Table 2. The route of the approximate location is preferable. If the river route should not be adopted, the line of the approximate location will require a very slight modification to make it complete.

The relative merits of the routes from near Watkins' are given in detail in Tables 1, 2, and 4. Table 1 shows main line from Station 313 to 700, between which points all the differences are embraced. Table 2 shows the difference between main line from Station 335 to 431, and the approximate location between the same points. Table 4 is a "Synopsis" of the river route between Stations 313 and 710 main line.

The advantages of the main line are in alignment and distance. The advantage of approximate location is in cost, being \$14,624 more than main, \$815.67 less than river line. The advantage of the river line is in inclination. The river line is 1165 feet longer, gives 23° more curvature, and \$815.67 more cost, according to the estimates, than the line made up of the approximate location and main line. The estimates for the main line were based upon the supposition that there would not be more than 10.022 cub. yds. of rock in the cut at the Hinsdale and Dalton line; and that the re-

mainder of the excavation would not cost more than 15 cts. per cubic yard for the mere excavation.

The whole amount of excavation in the cut is estimated at 168,197.7 cub. yds., nearly all of which would be useless material. With the exception of this cut both lines have been safely estimated. The amount of work upon the main line cannot be decreased to advantage. With regard to the river line a very important feature remains to be explained, viz: by locating the river line within say 50 feet of the Hinsdale factories, (Plunket's and the Hinsdale Manufacturing Company,) and cutting off about 150 feet of Plunket's Pond, the river at Plunket's might be crossed at least 5 feet lower, and the inclination be reduced to 74.5 feet per mile—and by reducing the amount of embankment very considerably across Curtis' meadow the curvature might be reduced to equal that by the other line. If the reduction of inclination by the river route, as at present located, should not be considered sufficient to counterbalance the increased distance, cost and slight increase of curvature, it will be necessary to make another location with the view of ascertaining the effect this reduction of grade would have. This however, will of course be necessary in any case.

From West Street in Pittsfield, the location is upon the route of Mr. Potter's "A" to the commencement of his "B" line, follows line "B" to Station 90 (B) and thence by direct line to Phelps' brook; intersects "D" line immediately after crossing, and then follows the general route of "D" line to its intersection with Mr. Potter's main line, at the Richmond summit (Lebanon Shaker's Farm.) From the Richmond summit it pursues the general route of his main line to Col. Rowley's. From Col. Rowley's to the State line it occupies higher ground, crosses Griffin's or Furnace brook about $\frac{1}{4}$ mile above Gates & Petty's Furnace, passes $\frac{1}{4}$ mile to the right of Capt. Griffin's, crosses the State line 240 feet right of termination of Hudson and Berkshire Rail Road, and intersects that road $\frac{1}{4}$ mile west of the State boundary. With the exception of a short plane (500 feet in length) at Leadbetter's, a proposed stopping place, it maintains an inclination of 45 feet per mile from the Richmond summit to the State line.

The total distance from 0 (2016 $\frac{1}{2}$) to the State line by the main located line is 141,230 feet (26 $\frac{3}{4}$ miles.) By the route of approximate location, at the Hinsdale factories,

the distance would be increased 250 feet. By the river route the total distance is 27 miles 1 chain. From Station 1370, a line marked X, considered as main line in table, was located to intersect the Hudson and Berkshire road at State line. The ground is not so favorable as by the main line, but possesses the great advantage of being entirely within this State. The western termination of main line, you said need not be estimated. Another line marked (4) upon the stakes, and designated by a fine red line upon the map, was located across Beaver Dam swamp for the purpose of occupying higher ground, on the northern side. This line slightly increases the curvature and distance, but will cost \$4233.77 less than the main line.

From Station 907, a line was located via Stearns' factory, or Stearnsville, upon the following general route: by "B" line to its intersection with Mr. Potter's main line; then by main to "C" line, by "C" line to its intersection with main line again, and then by main line to its intersection of main line of location, near Richmond summit, in Chapin's swamp. The Stearnsville line gives 600 feet less distance, but with regard to inclination, curvature, and cost, the main line has the advantage, as the annexed tables show; in addition to which it would be a more permanent road when constructed, as heavy bridging is avoided, and the roads are crossed to better advantage, and not so often. In fact every thing but distance appears to be in favor of the main line. (See Table 5.)

From the northern side of Beaver Dam swamp, a line was located to West Stockbridge village, by the valley of Cone's brook. This line crosses Cone's brook four times in the first two miles, and then from near W. Richards' saw-mill, follows upon the left side of the valley to within $\frac{1}{4}$ mile of the village; it then crosses the Pittsfield road at Cone's Marble Quarry, and follows a small valley which leads to the village, and terminates in the rear of the Hotel. The distance to West Stockbridge village is equal to the distance to the State line, by main located line. The distance from the village to the State line is $2\frac{3}{4}$ miles. The grades to the village will be 51 feet per mile for $2\frac{1}{2}$ miles, and 34 feet per mile for $1\frac{1}{4}$ miles. The State line is about four feet above grade at the village. There would, however, be a slight descent in going from the village to the State line, the ground occupied at the village being higher than the meadows and swamps intervening.

The cost of this line will be \$42,686.04 (from 1212½ of line (4)) or \$16,120.00 less than main line to the State boundary. The amount of curvature to the village is 296°, or 174° more than by either of the other routes, to State line. For details of the line, see Table 8. The cost of the Stockbridge line could not be reduced to advantage.

The route to West Stockbridge concludes the routes upon which accurate locations were made.

Two general routes were surveyed south of Pittsfield village. One marked "C" line upon the map, commences at Station 658 of main line, pursues a direct line for nearly three miles, passing a short distance north of Goodrich's pond, and crossing the east branch of the Housatonic, near the brick factory—between it and White's mill—after crossing the eastern branch, it turns the point of Pittsfield plain, crosses the middle branch near its intersection with Shaker mill stream or western branch, and follows the Shaker mill stream valley (crossing the stream twice) to near the mouth of Phelps' brook, where it intersects main line. This line is 700 feet longer, gives 44.182 feet more rise and fall, and \$9,552.61 more cost than the main line. The amount of curvature upon an accurate location would be about the same. The Tables give 6° less. For details of this line see Table 6.

From Richmond summit a route was surveyed passing through Richmond pond, and giving the most direct practicable line between Richmond summit and the Pittsfield and Dalton line. This line was commenced after having completed the surveys west, and was run from west to east. The "Pond route" was commenced with the intention of intersecting the main line again near L. Pomeroy's Satinet factory, and of course taking the route north of Pittsfield village. This line crosses the Shaker mill stream at the negro cabin near the intersection of the Stearnsville and W. Stockbridge roads—the most favorable point that could be found. The apparently proper direction was left upon crossing the Shaker mill stream for the purpose of avoiding any further descent, which would be requisite by following the river.

This line was 1900 feet shorter than the main line, but would require a grade of 60 feet per mile, and would cost much more than the main line; and besides requiring such

deep cuts, high embankments, and bridges, would be much less permanent. After this route was surveyed, you ordered a route to be surveyed north of Pittsfield village; the "C" line was surveyed. After surveying the "C" line, another connecting it with the Pond route was assumed, thus forming the Pond route, or second general route south of Pittsfield village. The line thus formed is 2400 feet shorter than the main line, and gives 38° less curvature, but intersecting the "C" line at its lowest point has the same objection of increased amount of inclination, gives a grade of 59.4 feet per mile, and would cost \$13,509.00 more than the main line. For details of Pond route see Table 7.

In addition to these general routes, several cross lines were attempted, but were all unsuccessful. The principal one is marked "Cross line" upon the map, and was an attempt to pass the high grounds south of the Shaker's mill, and to avoid two crossings of the river. This line leaves main line at Station 884 (negro house) and falls into the Pond route near Mott's, between the Shaker's mill and Barker's satinet factory. This line, in addition to crossing Shaker mill stream at an elevation of 50 feet, and giving a too expensive cut through the high ground, would require a grade of 50 feet per mile. No estimates were made upon it, the profile being considered quite sufficient. From the point where the main line crosses the town line of Pittsfield and Richmond, a route was surveyed to the State line at Hatch's Gap, to intersect the surveys which had been made to that point from Albany. This route deflects about 22° (nearer a west course) from the main line, and is nearly direct to about $\frac{1}{2}$ a mile west of Richmond village, (through which it passes, passing between Hall's store and the school house) and then pursues nearly a due west course to the State line, near J. Hatch's.

It intersects the State line $2\frac{1}{2}$ miles from the Canaan Gap intersection, and gives $2\frac{1}{2}$ miles less distance to the State line, and with regard to inclination, curvature and cost, is remarkably favorable. The expensive portion of the route does not commence until within the last mile. The obstacles by this route must of course be west of the State line. For details of the route to Hatch's, see Table 9.

Respectfully submitted by

your obedient servant,

J. C. CHESBROUGH.

A Synopsis of estimated cost of Grading and Bridging from Conn. River to Washington.

Stations.	Length.		Total Length.	Ascend of Grade.		Total of Ascend.	Descent of Grade.	Total of Descent.	Elevation of Grade of Ground		Elevation of Grade of Ground above Bench.	Elevation of Grade of Ground above Bench.	Grade per Mile.	Feet.
	Feet.	Miles.		Feet.	Miles.				W. R. R. Depot.	W. R. R. or Depot.				
From 760 or 9														
To	67	5800	1.0984				10.032	10.032	-404.950	-411.680	+ 8.465	+ 1.736		
	142	7500	1.4204	47.700		47.700			-114.982	-115.912	- 1.566	- 2.496	- 9.2928	
	201.3	5030	1.1231	3.6419		74.987			-367.282	-352.351	+ 46.134	+ 61.065	+33.5808	
	240	3870	0.7329	4.3745					-340.004	-339.514	+ 73.402	+ 73.402	+24.2880	
	280	4000	0.7575	5.1323					-340.004	-342.092	+ 73.412	+ 71.324	Level.	
	323	5300	1.0037	6.1369					-335.004	-339.067	+ 73.419	+ 74.349	+ 6.6000	
	420	8700	1.6477	7.7837			9.911	19.943	-344.915	-340.287	+ 68.501	+ 64.129	+ 9.8736	
	470	5000	0.9467	8.7306		5.000			-334.915	-350.949	+ 63.501	+ 62.467	Level.	
	501	3100	0.5871	9.3177		16.120			-339.915	-320.946	+ 73.501	+ 72.470	+ 5.2800	
	525	2400	0.4545	9.7722		101.008			-333.705	-320.318	+ 89.621	+ 84.099	+27.4560	
	547	2220	0.4166	10.1888		8.800			-323.795	-333.083	+ 89.621	+ 80.333	Level.	
	567	2000	0.3757	10.5675					-314.995	-293.178	+ 98.421	+ 124.238	+21.1200	
	600	12300	2.3205	12.8970		77.490			-237.505	-242.537	+ 175.911	+ 170.879	+33.264	
	705	1500	0.2840	13.1810		2.010			-235.495	-235.430	+ 179.921	+ 179.960	Level.	
	737	3200	0.6060	13.7570		15.510			-235.495	-235.156	+ 177.921	+ 175.926	Level.	
	770	3300	0.6250	14.4120					-219.985	-210.590	+ 193.431	+ 212.896	+24.816	
	839.1	6950	1.3162	15.7282					-219.985	-220.376	+ 193.431	+ 192.620	Level.	
	1098	25850	4.8958	20.6240		119.944			-100.041	-101.001	+ 133.375	+ 311.515	+24.4992	
	1108	1000	0.1833	20.8133		3.000			97.041	-103.024	+ 316.375	+ 310.392	+15.8400	
	1394	24600	5.4166	26.2299		180.187			+ 83.139	+ 74.324	+ 496.555	+ 487.740	+33.2640	
	1401	700	0.1325	26.3624		1.862			+ 85.001	+ 79.971	+ 498.417	+ 493.387	+14.0448	
	1431	3000	0.5631	26.9305		30.000			+115.001	+101.656	+ 528.417	+ 514.072	+52.8000	
	1503	7200	1.3636	28.2941		67.464			-128.465	-181.423	+ 595.881	+ 594.839	+49.4736	
	1536	3300	0.6250	28.9191		42.570			+225.035	+223.679	+ 638.451	+ 637.095	+68.1120	
	1874	33800	6.4015	35.3246		505.648			+730.683	+730.261	+1144.099	+1143.684	+73.9888	
	1980	600	0.1136	35.4342		171.425			+732.397	+732.068	+1145.713	+1146.377	+15.0849	
	1902.57	2257.0	0.4274	35.8630		22.724			+762.121	+760.304	+1175.537	+1174.320	+69.5376	
Totals. [189357] [35.8630] [19.943] +762.121 +760.904 +1175.537 +1174.320														
Extract from Estimate of approximate location between Ct. river and Sta. 1902.57 L. in Washington. Dis. 36.1718 m.														
Totals. [190987] [36.1718] [11.87014]														
Difference. [1630] [3088]														

SYNOPSIS OF ESTIMATED COST—(Continued.)

Stations.	Excavation.		Cable Yards.		Embankment.	Brigade.	Masonry.		Perches.		Cost of	REMARKS.
	From 760 or 9	Earth.	Rock.	L. Rock.	Cable Yards.	Length.	First and Abut.	Col. & Side Walls.	Gable Sides.	Cost of Turn. Rds. and moving Buildings.	Amounts.	
67	32833.36				36309.94	1225	6439.7			\$9145.10	60144.67	
142	34314.40	2096.65			20362.78		304.8	1934.8		50.00	13582.40	Including Ct. R. Bridge.
240	45720.12	3635.34			14149.20			167.5		205.00	13141.74	*Rub. arches \$5 pr perch.
280	19280.42				78874.87	15	94.0	36.0		87.50	118532.53	
333	64403.85	13487.11			56455.98	35	93.5	146.5		150.00	3321.49	
420	26138.14				23192.40		900.0	240.6		2020.00	42098.61	Tun. at G. Y. hill, 225 ft.
470	2143.25				12010.29			27.6		150.00	15711.75	
501	21.36				14143.11	20	204.0			250.00	4011.72	
525	22872.21				7944.50		30.0			80.00	3477.57	
547	1292.18				14065.13		15.6			4323.77	1982.16	
567	5958.13	504.50			77162.25		282.4	(90.7)		290.00	4936.10	
600	56132.51	2077.54			106349.27	76	1063.0	1574.4		492.50	19044.07	
705	99216.17	3184.31	895.56		70608.07					795.00	36062.18	
770	44714.48	20813.13	20379.95		9572.03	825	4925.6	3654.9	(45.4)	555.00	46203.22	
839	7864.21	25155.25			10551.41	130	570.1	200.0		3657.50	106195.94	
1098	5638.75	1259.70	10565.67		4961.94	363	1916.9	1111.1		187.50	5789.07	
1401	3710.80		3680.01		10967.87			1270.4		895.00	45831.26	Chester Village Depot.
1503	4408.74	3178.38	52.70		24941.77	250	1010.6	25.8		160.00	1581.12	Walker Brook Depot.
1536	851.27	1625.73			364071.80	85	1219.7	554.8		37.50	3577.79	
1874	159605.42	109620.37	52875.42		818.17	1389	20410.1	5507.7		50.00	12280.19	Cost to this point,
1880	270.31				8039.50	55	555.6	344.3		6786.25	354498.99	Cost of three last grades
1902.57	3.20	844.53	843.50		40192.61	230.4	317.1	417.50		218.75	5208.76	\$16,803.37 per Mile.
Totals.	1755005.28	187483.13	89298.61	1270055.41	446344737.10	17447.67	34574.5	885.73		3732.50	653588.52	per Mile Av.
Extract from Estimate of approximate location between Ct. river and Sta.	808163.57	113050.37	50450.59	1059571.96	446344737.10	17447.67	34574.5	885.73		3732.50	653588.52	per Mile Av.
Difference.	53158.20	54432.76	29848.02	210483.45	3	4574.5	885.73	23733.85	192284.55			Dis. 36.1718 m.

TABLE OF GRADES.					
Num. of grades.	6	5	3	4	2
Incl. per m. ft.	Level.	fr. 5.28 to 9.8736	fr. 14.0445 to 15.84	fr. 21.12 to 24.816	fr. 27.456 to 33.5808
Ag. length m.	5.1362	4.0907	.4354	7.0608	fr. 49.4736 to 52.8
Total l'gh de.	35.8630			1.9318	68.112 & 69.5376
				1.0524	79.968 & 80.9808

[illegible]

RADI AND LENGTH OF CURVES IN FEET.

[illegible]

TABLE OF CURVES—(Continued.)

[illegible]

TABLE OF CURVES—(Continued.)

RADI AND LENGTH OF CURVES IN FEET.										REMARKS.
Stations.	1910 3°	1646.38 3.1°	1687.14 3.1°	1598 3.1°	1432.50 4°	1345.89 4.1°	1273.50 4.1°	1146 5°	1041.81 5.1°	
From 9 to 28										
67										
94										
102.50										
112										
124.25										
131.25										
144.75										
153										
157										
159										
169										
170										
175										
176.25	500									
182.25										
198.25	1600									
198.80										
228.80										
231.05										
276.75										
313.75										
318.65										
333.15	1450									
353										
368										
376										
388										
407										
440										
462.50										
504										
509										
							3000			Tatham hill in West Springfield.

TABLE OF CURVES—(Continued.)

RADII AND LENGTH OF CURVES IN FEET.										REMARKS.
Stations.	1910 3°	1848.38 3.1°	1837.14 3½°	1298 3½°	1432.50 4°	1345.88 4½°	1275.50 4½°	1146 5°	1041.91 5½°	
9 to 514.5										
534.5										
565.										
583.										
616.										
625.										
640.										
663½										
682½										
693.87				1150						
704.23							925			
713.48										
714.60										
726.10										
728.50										
732.50										
735.50										
744.50										
745.										
774.75										
782.95										
791.25										
802.25										
802.75										
819.75										
820.25								1700		
827.25								700		
827.75										
834.25										
836.25										
839.75										
844.80										
861.										
										Short bend of River at Tekos mountain.

TABLE OF CURVES—(Continued.)

[illegible]

TABLE OF CURVES—(Continued.)

RADI AND LENGTH OF CURVES IN FEET.										REMARKS.
Stations.	1910 3°	1849.38 3 1/2°	1637.14 3 1/2°	1598 3 1/2°	1492.50 4°	1345.88 4 1/2°	1273.50 4 1/2°	1146 5°	1041.81 1 1/2°	
9 to 1718.90					1000					
1728.90										
1730.10						1800				
1748.10										
1749.25						900				
1758.25										
1764										
1771										
1772										
1779										
1786										
1788										
1794										
1800.65										
1818.65										
1831.50										
1840.50										
1845.25										
1856.50										
1859.50										
1894										
1894.55										
1902.20										
1902.57										

Distances. 8199 2800 1425 3150 6362 9150 3925 3050 3300
 Amt. def. 245°58' 86°48' 49°52' 117°07' 254°49' 388°53' 176°37' 152°30' 181°30'
 Total amount of Deflection in degrees 3032°58'
 do. Length of Straight line—feet. 61,845 11,71306 miles 449° less than approximate Location.
 do. do. of Curved line—feet. 127,512 24,15000 " .96914 " "
 do. do. of Route 189,357 35,86306 " .6504 greater " "
 do. do. of Route 190,987 36,1718 " .30874 " "

EXTRACT FROM APPROXIMATE ESTIMATE.

Total amount of Deflection in degrees, 3481°58'
 do. Length of straight line in feet, 66,462 12,6822 miles
 do. do. of curved line in feet, 124,025 23,4846 "
 do. do. of Route, in feet, 190,987 36,1718 "

COMPARISON OF PARTS OF ROUTES.

Routes.	Stations.	LENGTHS.			Deflec. degrees.	RADI IN FEET.			GRADES.			EXCAVATION			Bridg- es	Embank- ment Cub. Yds.	Total cost per Mile.
		Straight line. Feet.	Curved line Feet.	Total in Feet					Length in Feet.	Inclination per Mile Feet.	Rise in Feet.	Earth.	Rock.	L. R.			
351 to 420 "L" Route through West field, North side of River, from Sta. 351 to 731.	351 to 420	2300 ¹	4600 ¹		65°30'	3820	2865	5730	6900 ¹	Level.		17121.			48220.	26	13,982
	470	2750	2250		22°30'	5730			5000 ¹	5.2800	5.	2143.			23192.	35	4,011
	501	3100			15°30'	5730			3100 ¹	27.4560	16.120	29.			12910.	20	3,011
	525	850	1550		9°30'	5730			2400 ¹	Level.		22872.			14143.		4,323
	547	1250	950		4°00'	2865			2200 ¹	21.1200	8.800	504 ¹			7944.		1,953
	567	1800	200		104°45'	2865	5730	3820	2000 ¹	Level.		5958.			14065.		4,936
	600	6700	5600		38°33'	2865	1273 ¹		12300 ¹	33.264	77.490	2077 ¹			77152.		19,044
	705		1500		98°59'	1432 ¹	1910	2865	1500 ¹	7.0752	2.010						36,062
	737	652	2548		65°00'	2865			3200 ¹	Level.		99216.17	3184 ¹	895	106849.	76	1,925
	770	50	3250		9°30'	2865			3300 ¹	24.8160	15.510	8503.			3813.		89,745
Total.		20077	22223	42300	8.1439	433°50'			1100 ¹	Level.		8503.					1,925
351 to 393 W. village Route No. 2, L. via. Mr. Phelps'.	351 to 393	1400	2800		44°71'	3820	2565		4200 ¹	Level.		1049.94			17534.09	175	12,469
	473	7300	700		10°30'	3820			8000 ¹	9.8280	14.880	5052.62			29047.70	140	10,325
	548	4334	3166		50°	3820	5730		7500 ¹	10.5560	15.000	24423.64			16510.89	18	7,633
	658	2500	8200		89°	5730			11000 ¹	7.2336	15.070	47679.69			73077.38	20	19,694
	794	5508	7792	44300	8.390	221°50'	5730	1910	13600 ¹	31.0464	79.980	120144	33	2391 ¹	215072.51	188	80,348
Total.		21642	22658	44300	8.390	408°27'			124.930	198350.22	2391 ¹				351642.57	541	130,479
351 to 393 W. V. Cross Route No. 2, via. D. Smith's.	351 to 393	1400	2800		44°71'	3820	2565		4200 ¹	Level.		1049.94			17534.09	175	12,469
	473	7300	700		10°30'	3820			8000 ¹	9.828	14.88	5052.62			29047.70	140	10,325
	559	6366	2334		33°30'	3820	5730	3820	8600 ¹	8.6064	14.018	21123.98			19331.76	18	7,257
	569	6000			79°45'	5730	3820	1528	1000 ¹	Level.					14217.44	185	12,501
	689	7300	4700		38°38'	1528	2865	1273 ¹	12000 ¹	34.54528	75.512	38803.04			77792.56		23,266
	704		1500		98°59'	1432 ¹	1910	2865	1500 ¹	7.0752	2.010						36,062
	736	652	2548		65°	2865			3200 ¹	Level.		99216.17	3184 ¹	895	106849.	76	1,925
	769	50	3250		9°30'	2865			3300 ¹	24.816	15.510	8503.			3813.		89,745
	780	625	475	42900	8.125				1100 ¹	Level.							1,925
Total.		24593	18307	42900	8.125	380°03'			124.930	173748.75	3184 ¹	895			127885.55	594	103,808

Remarks.—*100 feet longer than No. 2 V. R. 1300 feet shorter than No. 1 V. R. Total Grade, 219.955.—†Bridging Rivers, \$32,627.60. By a moderate increase of cost, this Route may be shortened 200 feet, and curvature reduced from 538 to 604—76°. Total Grade, 219.955. \$40,727 more than "L" line, including 1300 feet superstructure.—‡Bridging Rivers, \$23,453.10. 100 feet shorter than "L" 1400 feet shorter than No. 1 V. R. Total Grade, 219.955. \$14,062.90 more than "L" Route, \$30,620.10 less than No. 1 V. R.

COMPARISON OF PARTS OF ROUTES—(Continued.)

Routes.	Stations.	LENGTHS.			Deflection degrees.	RADII IN FEET.			GRADES.			EXCAVATION.			Embank- ment. Cub. Yds.	Total cost per Mile. Dols. C.
		Straight line. Feet.	Curved line. Feet.	Total in Feet.					Length in Feet.	Inclination per Mile. Feet.	Blue in Feet.	Earth. Cub. Yds.	Rock. Cub. Yds.	L. R.		
"L" Route fr. Gould's to above Chos. village.	1004.32 to 1181.28.	1323	11323	12646	2.3950	246°29'	5730	14321	4244	2865	12646	av 25.0541	60.	9124	49105.	390 41,921.79
	Totals.	1923	11323	12646	2.3950						60.					41,921.79
	1004.32 to 1181.28.	4050	8102	12212	2.3125	260°30'	1525	1910	2292	1763	1637	12212	av. 28.535	66.	94636.	49,180.92
"L" route fr. Ches. Vil. to Sanderson's.	1004.32 to 1181.28.	4050	8102	12212	2.3125	260°30'	1525	1910	2292	1763	1637	12212	av. 28.535	66.	94636.	49,180.92
	Totals.	4050	8102	12212	2.3125						66.					49,180.92
	1108 to 1300	4717	14453	19200	3.6363	327°53'	4584	2865	2274	28	2292	19200	33.264	120.96	50180.7	24,808.77
"A" Route via Osborn's fr. C V. to 1300 "L."	1108 to 1289	4781	8313	13100		138°34'	4584	2865	2274	28	2292	13100	35.1120	87.115	63552	28,786.21
	1289.22 to 1300	1407	4215	5622	3.5458	94°28'	5730	3820	1848.35			5622	31.7861	33.845	49349.98	34,675.16
	Totals.	6188	12534	18722	3.5458	232°62'								120.96		34,675.16
"L" route fr. Sanderson's to A. Smith's.	1309.45 to 1394.05	1460	7000	8460	1.6022	83°16'	3439.37	7162.5	5730			8460	33.264	53.267	8300.32	21,799.44
	Totals.	1460	7000	8460	1.6022	83°16'								53.267		21,799.44
	1309.45 to 1394.05	1595	7440	9035	1.7111	174°09'	3183	2292	3404	2022	3439	9035	31.153	53.070	59317.65	26,919.02
"S" Route via Knox's.	1394.06 to 1474.06	1595	7440	9035	1.7111	174°09'								53.070		26,919.02
	Totals.	1595	7440	9035	1.7111									53.070		26,919.02
	Fr. 1394 to 1474	8084	25716	33800	6.4015	787	Min. Rad. 1345.88							78.988	505.6	364071
"L" Route; Pontoon Grade.	Totals.	8084	25716	33800	6.4015	787								505.6	159.695	364071
	1474 to 1988.5	10750	23400	34150	6.4063	665	Min. Rad. 996.5							71.87	54.77	379882
	Totals.	10750	23400	34150	6.4063	665								83.18	507.5	379882

Remarks.—Including cost of superstructure on 434 feet excess of length.—(On and along side of Turnpike, 2800 feet. \$7,259 more than "L" Route.—1478 feet superstructure.—2 Bridges \$12,037 478 feet shorter than "L" Route. \$8,888.95 more than "L" Route.—1575 feet longer than "L" Route, including 575 feet superstructure. \$5,119.58 more than "L" Route.—1350 feet shorter than Approximate Route. \$53,008 more than Approximate Route.

SYNOPSIS OF ROUTES.

Table No. 1.

Sta.		Character of line upon each plane.										Excavation, Embankment, &c. in each Section.										Grubbing, Digging, &c. Feet.	Amount. Dollars.
		Grade per mile.					Total Ascent.	Total Descent.	Above Ct. River.	Excavation			Emb'k. Cubic Yards.	Excess Exca.	Excess Emb'k.	Maschry. Perches.							
		1000	1000	1000	1000	1000				Earth.	Rock.	L. R.				Cul.	Abut.	Ar. b.w. Ar.					
From 0 to 25	2500	Surf'g Line.	11460	7640	5790	4584	3930	3265	69.537	1175.537	1208.340	1175.537	7185	846	9075	1044	115	150	25	2400	4,110.37		
70	2975								69.062	1367.200	1378.233	1367.200	19268	1142	22748	1198	60	1500	50	1400	11,995.23		
144.27	3727								78.936	1378.233	1378.233	1378.233	263483	23989	742746	17885	340	2545	315	55	1600	133,429.40	
188	1923									1378.233	1378.233	1378.233											
216	1050									1388.233	1388.233	1388.233											
200										12.950	1375.283	89410			94834	5894	60	295	15	3900	21,216.62		
3525									16.579	16.130	1372.103	8462			16487	8025	125		25	1650	4,243.90		
5300									3.168	1373.103	1373.103												
333										2000	213.809												
347	1217									1400													
377	3000								9.504	21.530	1367.703	9682			13992				195	10,471.28			
387	1000									1367.703		51509			28763	24344	40	1450	150	1400	20,601.40		
440	3200								73.286	95.092	1294.141	150411	100922	10025	8712	161746	220				48,644.95		
												29170	2000	32712	2000	1542	375		2500	9,498.97			
												26393	1000	24469	2000	2923			2000	7,408.20			
												785		104218	1000	103433	345		1000	20,589.48			
6570	10487	1100	100	1100					79.992	443.574	945.659												
680	1000								22.841	447.900	941.333												
710	3000									941.333	941.333												
												8625			84553	75998	80	825	60	450	19,934.17		
												20284			24290	4006	145				5,857.85		
REMARKS.—End of Section No. 1 is Station 44. End of No. 2 is 70. End of No. 3 is 178. End of No. 4 is 260. End of No. 5 is 318. End of No. 6 is 387. End of No. 7 is 431.																							

REMARKS.—End of Section No. 1 is Station 44. End of No. 2 is 70. End of No. 3 is 178. End of No. 4 is 280. End of No. 5 is 315. End of No. 6 is 387. End of No. 7 is 431. End of No. 8 is 484. End of No. 9 is 545. End of No. 10 is 600. End of No. 11 is 638. End of No. 12 is 710. End of No. 13 is 747.

SYNOPSIS OF ROUTES—(Continued.)

Sta.	Character of line upon each plane.										Excavation, Embankment, &c. in each Section.														
	Strgt. Line.	11460	7640	5730	4384	3920	2265	Grade per mile.		Length of Plane.	Total Ascent.	Total Descent.	Total Above Ct. River.	Excavation			Emb'k. Cubic Yards.	Excess			Grubbing, &c. Feet.	Amount. Dols.			
								Ascent.	Descent.					Earth.	Rock.	L. R.		Excava.	Em'b'k.	Cul.			Abut.	Ar.	h.w.
From 0 to 795	6025			2475				7.392		8500	225.709		953.233	50864			53130	2266	290		13,648	40			
820	1000			1500						2500	225.709	447.900	953.233	19637			19699	62	40	575	60	7,039	00		
880	3600			200	1100		1100		3.537	6000		451.900	949.233	63506		1628	72949	7815	260	1150	100	22,960	90		
890				1000				39.600		1000	233.209		956.733												
920	1300			1700				44.880		3000	258.709		982.233												
930	1000							21.120		1000	262.709		986.233												
1010	4300							44.880		800	330.709		1054.233	48641	3126		91226	39459	505		25	22,444	30		
1026	1600			1800	1900					1600			1054.233	8646	2898	500	27830	15786	20	275		9,967	05		
1080	5400							1372.8		5400	344.709		1068.233	71584	15452		83620	3416	190	800	100	37,834	40		
1120	5400									4000			1068.233	15972			7839	8133	20	100	20	3,852	90		
1140	1000		1000					13.200		2000	349.709		1073.233	18268			5411	12857	75		900	3,686	65		
1147.65	165		600							765			1073.233												
1250	5635		2100			2500		44.880	10235			538.897	986.233	31468	6830		14450	17018	105		2800	6,416	20		
1255			500					5.280	500			539.397	985.733	57554			4053					18,657	70		
1411.56	5256	600	4000	1400	2400	2000				15656		672.473	852.658	951			19424	18473	200	50	40	31,686	30		
																						20,167	40		
																						18,394	10		
																						4,118	10		

REMARKS.—End of Section No. 14 is Station 803. End of No. 15 is 830. End of No. 16 is 888. End of No. 17 is 968. End of No. 18 is 970. End of No. 19 is 1090. End of No. 20 is 1090. End of No. 21 is 1110. End of No. 22 is 1147. End of No. 23 is 1180. End of No. 24 is 1253. End of No. 25 is 1383. End of No. 26 is 1385. End of No. 27 is 1411.

Table No. 5.

STEARNS VILLAGE LINE.

Sta.	Char. of Line upon each Plane.					Grade pr. M.	Total Rise.	Total Con. R.	Excavation, Embankment &c. in each Section										REMARKS.				
	Surf'g. Line	Rad. 7640	Rad. 2865	Rad. 1910	Asc't. Des't.				Excavation.		Cubic Yards.	Excess Excav.	Excess Emb'k.	Masonry		Grub. Feet.	Amount.						
									Earth	L. R. S. R.				Excav.	Emb'k.			Col.		Adic.			
883									951.423														
886		700				39.600	5.250		956.733														
1010	5085	4600		1275	1040	44.880	12000	107.250	1058.733			10626	141433		53754		5225	245		60508	37	End of Sec. 1. 480	
1050	4000					Level.	4000	107.250	1058.733			13506	13300		2306		620	40	1500	608652	do. No. 2.		
1080	3000					16.736	3000	116.759	1068.233			70173	70000		35627	34546	300		4300	17895	97		
1140	1300		1100			Level.	2400	116.759	1068.233													Sta. 1110 of main L.	
11385	5300	1100	1275	1040			22100	116.759				171353	8830	10626	188260	36852	53754	300	5875	285	5800	84490	86

Table No. 6.

C. LINE.

[illegible]

Table No. 7.

POND LIFE.

Sta.	Character of line upon each plane.						Excavation, Embankment, &c. in each Section.										REMARKS.			
	Str't Line.	1°	2°	Grade per mile.	Le'gth of Plane.	Total Ascend.	Total Descent.	Above Ct. River.	Excavation			Embankment			Grubbing, &c. per Foot.	Amount.				
		Rad.	Asc't.						Desc't.	Earth.	Rock.	Cub. Yds.	Excess Excava.	Excess Emb'k.				Masonry Purches.	Cul. & Abut.	Dolla.
Fr. 635	1200			80.000	1200		18.180	945.659	962.819											
or 0 to 12	38	2600		33.600	2600		37.580	626.159	945.659											
119	8100				8100	4.050		930.209	930.209	40253		86602	100	750	60	19,523.21	End of Sect. No. 1.			
152	3300		2.640		3300			930.209	930.209			21205	275	75	70	11,533.78	do. do. No. 2.			
180	1100	1700		13.200	2800		44.556	923.233	923.233											
195	1500		17.582		1500	9.050		928.233	928.233	60992		62650	50	1920	115	24,759.26	do. do. No. 3.			
225	6300	3200	53.400		10000	121.550		1040.733	1040.733	80752	10953	5000	880	800	50	57,873.89	do. do. No. 4.			
									48303			10600	550	65		12,935.60	do. No. 5 at Sta. 33.			
359	4800	1600	12.302		6400	136.550		1055.733	1055.733											
377	1500				1800			1055.733	1055.733	84052		86290	20	125	30	23,636.05	do. No. 6 at Sta. 38.			
407	3000		20.592		3000	148.250		1066.653	1066.653											
428	500	1600	2.011		2100	149.050		1065.233	1065.233	7630		33992	230	125	30	10,420	do. No. 7 = 1110 of M.			
Totals.	34700	6400	1700		42800					321982	10953	5000	491195	56751	210011	1555	4350	420	6400	160,734.79

Table No. 8.

West Stockbridge Line.

Sta.	Character of line upon each plane.										Grade.		Excavation, Embankment, &c. in each Section.										REMARKS.				
	2°		2½°		3°		3½°		4½°		Desc't. per M.	Length Plane.	Total Descent.	Above Ct. River.	Excavation.			Em'b'k.			Masonry, &c.			Grub- bing. Feet.	Amount.		
	Sir-g't Line.	2565	2346	2292	2083	1910	1637	1348	Excav. Cubic Yards.	Excess Exca.					Em'b'k. Yards.	Excess Em'b'k.	Cul.	About.	Dolls.	C.							
1212½ or 0 to 127	4275												1018.533			22566	33067	10501	140	525	70	500	10,332	21	End of Sect. 1 at Sta. 7		
200	3900	900				2400	100				34.320	7300	170,005.	849.898	30952	5483		37835	64854	24631	305	700	50		19,671	29	do. No. 2 at Sta. 14
Totals.	8175	900	2575	1900	2400	2200	450	1400			20000						91353	7821	100408	33948	35182	525	160	500	42,795	70	do. No. 3.

HATCH'S GAP LINE.

Recapitulation of principal items compared with Main Line.

Routes.	Surgt. Feet.	11460	1° 30'		2° 30'		1° 10'		14° 30'		14° 30'		14° 30'		2° 06'		21° 06'		23° 06'		3° 06'		4° 06'		41° 06'		21° 06'		Amount of Inclination.			Amount.							
			Rad.	11460	Rad.	7640	Rad.	5780	Rad.	4830	Rad.	4830	Rad.	4830	Rad.	4830	Rad.	2992	Rad.	2992	Rad.	2083	Rad.	1910	Rad.	1637	Rad.	1432	Rad.	1938	Rise.		Fall	Total.	Total Amount dia. in Curva.	Total Amount dia. in Curva.	\$	C	
Main Line.	84321	8° 30'	43° 30'	183° 45'	66° 15'	188° 22'	264° 45'								44° 06'	29° 15'																755° 07'	26° 76'	349° 709'	672° 473'	1022° 182'	538° 375' 10"		
River do.	83270	5° 00'	33° 18'	177° 00'	66° 15'	201° 00'	250° 45'																									833° 06'	27° 03'	349° 709'	672° 473'	1022° 182'	525° 066' 7"		
Stearns Village do.	81106	8° 30'	53° 00'	177° 00'	66° 15'	188° 22'	200° 15'																									792° 52'	26° 65'	349° 709'	672° 473'	1022° 182'	545° 582' 6"		
4 th Cr. do.	88996	8° 30'	21° 45'	140° 00'	66° 15'	207° 52'	304° 45'																									743° 07'	26° 59'	371° 803'	694° 577'	1066° 380'	548° 427' 6"		
Pond do.	80596	8° 30'	21° 45'	179° 45'	42° 30'	188° 22'	276° 45'																									717° 07'	26° 19'	371° 803'	694° 577'	1066° 380'	552° 384' 11"		
W. Stockbridge do.	83700	5° 30'	43° 30'	128° 45'	48° 45'	152° 22'	242° 45'								57° 56'	66° 06'																934° 10'	26° 76'	349° 709'	676° 473'	1026° 182'	529° 755' 07"		
Hatch's Gap do.	73765	5° 30'	43° 30'	146° 45'	48° 45'	190° 22'	226° 45'																									706° 37'	24° 39'	450° 805'	471° 973'	922° 788'	496° 094' 11"		
Apprixi. Location.																																		960° 30'	27° 06'	356° 72'	679° 473'	1036° 182'	499° 046' 6"

Springfield, January 14, 1839.

**THOMAS B. WALES Esq., PRESIDENT OF THE WESTERN
RAIL-ROAD CORPORATION.**

DEAR SIR,

Since the Report of the 16th March last was communicated to the Board, two additional lines through a part of Westfield have been surveyed, and as some facts have been collected which may have weight in deciding upon the final location of that part of the line which has not yet been definitively acted upon by the Board, we take advantage of the present meeting to communicate the results which the surveys in question have furnished.

At a distance of $1\frac{1}{2}$ miles west of the village of Westfield, and near C. Coburn's, on the northern route, (see accompanying map,) a straight line was traced across the low grounds to a point opposite the junction of the Montgomery and Westfield roads, a distance of $1\frac{1}{2}$ miles; thence by two curves of 3820 and 2860 feet radius, respectively, the line reaches the point of Tekoa mountain between the trunk of the canal feeder and a neighborhood road which follows the bank of the river, thence conforming to the shape of the hill by a curve 1100 feet in length, of 1348 radius, the line pursues a course intermediate to the canal feeder and the road before referred to, and finally unites with the line as originally located, west of widow Palmer's.

This line we denominate the "Meadow line;" and the following table exhibits its curves, grades, &c., in connexion with those of the location or line "L".

Name of Routes.	Length Miles.	Deflec- tion. Degrees.	Mini- mum Rad.	L'gh of Curve	Max. of grade. Feet.	L'gh same. Miles.	Cost of Graduation.
North line.	8.1439	433°53'	1273	925	33.26	2.33	89,745.40
Meadow line.	8.1320	337°46'	1348	1150	35.42	2.66	82,488.75
Differences.	0.0119	96°07'	75	225	2.16	0.33	7,256.65

Thus it will be seen that the advantages of the meadow line are these. It is 63 feet shorter than "L", it has 96° less deflection, its minimum radius is 75 feet greater than "L", its cost of graduation is \$7,256.65 less.

Its disadvantages are, that it has 2.25 feet more of curvature of minimum radius than "L", its maximum grade is greater by 2.16 feet per mile, and there is 0.33 of a mile more of it.

These differences however are comparatively unimportant when referred to the main obstacle, to wit: the canal feeder at the point of Tekoa mountain.

The original location, as has been stated in a former Report, followed the direction of the feeder bank. A portion of the feeder is formed of a wooden trunk; the length of this trunk is about 550 feet, and is placed at the rocky point of the mountain. The Rail Road being located on the feeder bank would make it necessary to introduce in place of this perishable structure, something of a more permanent nature, and notwithstanding the Hampshire and Hampden Canal Company have shown every disposition to accommodate the Rail Road Corporation, and to grant them every reasonable facility within their control, still it is not to be expected that the Canal Co. will look beyond their own interest, if it involve an expenditure of money. To give permanence to the feeder at the point of Tekoa would necessarily prove an expensive undertaking.

It was with the view of avoiding this difficulty that we have sought for another line. This line, possessing as it does, the advantages ascribed to it over the former location, has a corresponding disadvantage attending it, of rather a serious nature. A part of the neighborhood road which we have before spoken of, and which is delineated on the accompanying map, is covered by the present location, and this difficulty can be obviated by one of the following expedients only. 1st. To preserve the road by the erection of bank walls, both at the embankment and at the river shore. 2nd. To purchase the rights of some three or four individuals, and to provide them an outlet from their lands by a cheap bridge at Salmon falls. And 3d. To have the road discontinued by the county commissioners.

The first is entirely practicable, but it will be *expensive*; still if there were no alternative, we should not hesitate to recommend it for adoption by the board in preference to recommending the south route.

From inquiries which have been made for the purpose, there is but little reason to apprehend any serious difficulty

in accomplishing the second object. Indeed the farms themselves could be purchased for a much less sum than it would cost to preserve the road. There is no doubt entertained by us that this object could be effected for much less than the estimated difference in the cost of the two lines.

It is proper to remark that no provision has been made in the estimates for preserving this road. It is an item which will be chargeable upon both the north line and the village line (which we are about to refer to,) and therefore the comparative merits of the two lines will not be affected.

The additional line which has been traced towards the village of Westfield from Tekoa, deflects from the Meadow line at the junction of the Montgomery and Westfield roads, and crosses the Westfield river $\frac{1}{4}$ of a mile west of the crossing of the 'middle route' (described in the Report of 16th March last,) thence by a very direct course, with slight curves, towards the village of Westfield, and unites with the middle and south lines about $\frac{1}{4}$ of a mile west of the village. This line is three miles long. It was run in connexion with that part of the meadow line which lies west of the fork of the Montgomery and Westfield roads. As it is the best of the village lines, and its cost less, we shall take it for the purpose of instituting a comparison between a line through the village and the meadow line north of the river.

Routes.	Length Miles.	Deflec- tion. Degr's.	Mini- mum Rad.	L'gth of mum C'ves	Maxi- mum grade.	L'gth same Miles	Cost of Graduation.
Village line.	8.1212	337.46	1348	1150	35.42	2.66	82,488.75
Meadow line.	8.1320	284.00	1348	1150	35.42	2.50	89,875.58
Differences.	0.0108	53.46	Com. to both lines.			0.16	7,386.83

The distance, deflection, quantity of maximum grade, are all in favor of the village line, the cost is against it. But, as was remarked of the two lines north of the river, these differences become insignificant when compared with the more serious obstacles which characterize this line. They have been fully enumerated in the Report of 16th March, and it is deemed unnecessary to repeat them here.

In conclusion, we reiterate the opinion expressed heretofore, that we consider the line by the north side of the river the preferable route. The developments of the late surveys have but added strength to the favorable impressions which we then entertained, and it remains to us only to express a

hope that the Board may find that they have all the facts before them which they require in reference to the lines through Westfield, to enable them to decide in favor of that route which shall best subserve the interests of the corporation.

Respectfully submitted,

W. H. SWIFT.

Springfield February 25, 1839.

CHARLES HUDSON Esq., CHAIRMAN COMMITTEE, &c.

DEAR SIR,

The surveys and estimates which were in progress at the date of my last letter, are now completed, and I have the means of laying before the committee the information relative to the several lines through the town of Westfield, called for in your letter of 13th instant.

1. A line "north of the north line" passing near the house of Harvey Champion (at the margin of the meadow) has been located, the projected grade of the same is laid $1\frac{1}{2}$ feet above the freshet mark of January last. This line is 678 feet longer than the old north line, and has 62 degrees more of deflection than that line; this deflection is made upon a curve of $3^{\circ} 04'$, the corresponding radius of which is 1868 feet. This line is 731 feet longer also than the village line. The cost of this line beyond that of the old north line is \$14,830, this sum includes an item of \$1,384 for superstructure for the additional length of the road.

2. Upon the old north line, with the grade raised $1\frac{1}{2}$ feet above the freshet mark, including revetment walls, &c. the additional cost would be \$19,323.

3. The additional cost, produced by raising the grade of the Village line $1\frac{1}{2}$ feet above the freshets is \$18,418. This sum includes the cost of 335 feet of *additional* bridging.

The following summary exhibits the cost of each line between Morley's bridge and Tekoa mountain, with grades established $1\frac{1}{2}$ feet above the freshet of January last. The north line is made up of the north line proper, and the meadow line described in the Report of the 14th January last.

1. North line by Champion's	97,318.75
2. Old north line	101,811.75
3. Village line	108,293.58

A line has been traced between the old north line and that by Champion's; it will, most likely prove to be a better

SYNOPSIS OF ROUTES—(Continued.)

Sta.	Character of line upon each plane.										Excavation, Embankment, &c. in each Section.										Grubbing.	Amount.
	Grade per mile.		Length of plane.		Total ascent.		Total descent.		Above Cl. River.		Excavation Cub Yds.		Embankment Cub Yds.		Excess Excavation.		Excess Embankment.		Perches.			
	Str't Line.	Rad. Line.	10° Rad.	11° Rad.	12° Rad.	Ascent.	Desc't.	Ascent.	Desc't.	Cl. River.	Earth.	Rock.	L. R.	Emb'k. Yards.	Excav. Yards.	Excess Emb'k.	Excess Excav.	Cul.	Abut.	Ar.		
From 0 to 795	6025		2475			7.392		8500	225.709		50864			53130		2266	290					
820	1000		1500					2500	225.709	953.233	19637			19639		62	40	575				60
880	3600		200	1100		3.537	6000		451.900	949.233	63506		1628	72949		7815	260	1150				100
890								1000	233.209	956.733												
920	1300		1000			39.600		3000	258.709	982.233												
930	1000		1700			44.880		1000	262.709	986.233												
						21.120																
1010	4300										48641	3126		91226		39459	505					25
1026	1600		1800	1900		44.880		800	330.709	1054.233	8646	2898	500	27830		15796	20	275				
1080	5400							1600		1054.233												
1120	5400					1372.8		5400	344.709	1068.233	71584	15452		83620		3416						100
1140	1000							4000		1068.233	15972			7839		8133						20
1147.65	165		600			13.200		2000	349.709	1073.233	18268			5411		12857						900
								765		1073.233												
1250	5635		2100		2500	44.880	10235			986.233	31468	6380		14450		17018						2800
1255			500			5.280	500			985.733	57554			4053		105						
											47798	4322	2200	119784		65464	85	325				25
											53891	2001	5602	57200		4224	345	675	160			1500
											34448	8161		34263		8346	340	50				40
1411.58	5256	600	4000	1400	2400	2000	15656			852.658	951			19424		18473	200					4

REMARKS.—End of Section No. 14 is Station 802. End of No. 15 is 830. End of No. 16 is 888. End of No. 17 is 902.

REMARKS.—End of Section No. 14 is Station 802. End of No. 15 is 830. End of No. 16 is 883. End of No. 17 is 988. End of No. 18 is 970. End of No. 19 is 1030. End of No. 20 is 1080. End of No. 21 is 1110. End of No. 22 is 1147. End of No. 23 is 1190. End of No. 24 is 1255. End of No. 25 is 1388. End of No. 26 is 1385. End of No. 27 is 1411.

Table No. 2. Main line between 335 and 431 compared to App. Loca.

ROUTES.	Character of Line.			Grades.		REMARKS.
	1°	2°	Total Dist.	Planes	Feet.	
Main Line	1200	900	7.500	9600	73.286	4400/29620
App. Location	2050	2550	4.350	9850	70.000	4650/14996
Differences	1200/1650	2950/3.150	250	3.286	250/14624	

Table No. 3.

ROUTES.	Character of Line.			Grades.		REMARKS.
	1°	2°	Total Dist.	Planes	Feet.	
Main Line	1200	900	7.500	9600	73.286	4400/29620
App. Location	2050	2550	4.350	9850	70.000	4650/14996
Differences	1200/1650	2950/3.150	250	3.286	250/14624	

Table No. 4.

ROUTES.	Character of Line.			Grades.		REMARKS.
	1°	2°	Total Dist.	Planes	Feet.	
Main Line	1200	900	7.500	9600	73.286	4400/29620
App. Location	2050	2550	4.350	9850	70.000	4650/14996
Differences	1200/1650	2950/3.150	250	3.286	250/14624	

Table No. 3. River Route From Station 313 to 710 of Main Line.

Sta	Str't. Line.	10	10	20	20	30	Grade pr. mile.	Le' gth of Plane.	Total Asc't.	Total Descent.	Excava. Earth.	Emb'k. Rock.	Yds. L. R.	Emb'k. Cubic.	Excess of Embk.	Masonry. Cul.	Abut.	Grubbing. Feet.	Amount.	REMARKS	
		11460	5730	3930	2985																
						</															

Table No. 5.

STEARNS VILLAGE LINE.

Char. of Line upon each Plane.		Grade pr. M.			Total Fall.	Above Con. R.	Excavation, Embankment &c. in each Section										REMARKS.	
Sta.	Str'g. Line	3 ^d	2 ^d	1 st			Lg'th of Plane.	Excavation.		Cubic Yards.		Excess Excav.	Excess Emb'k.	Masonry				Amount.
		7649	5730	3265	1910			Earth	L. R.	S. R.	Emb't	Excav.	Em'k.	Col.	Abc.	Brick.	\$	& cts.
883																		
to 890		700																
1010	5085	4600	1275	1040	44.880	12000	107.250	87679		10626	141433		53754			60508	37	End of Sec. L. 489
1050	4000				Level.	4000	107.250	13506	1330		11200	2306				620	40	Per. Bank Wall.
1080	3000				16.736	3000	116.759	70173	7000					300				do. No. 2.
1110	1300	1100			Level.	2400	116.759					35627	34546			4300	17895	97
13285	5300	1100	1275	1040		22100	116.759											Sta. 1110 of main L.

Table No. 6.

C. LINE.

[illegible]

Table No. 7.

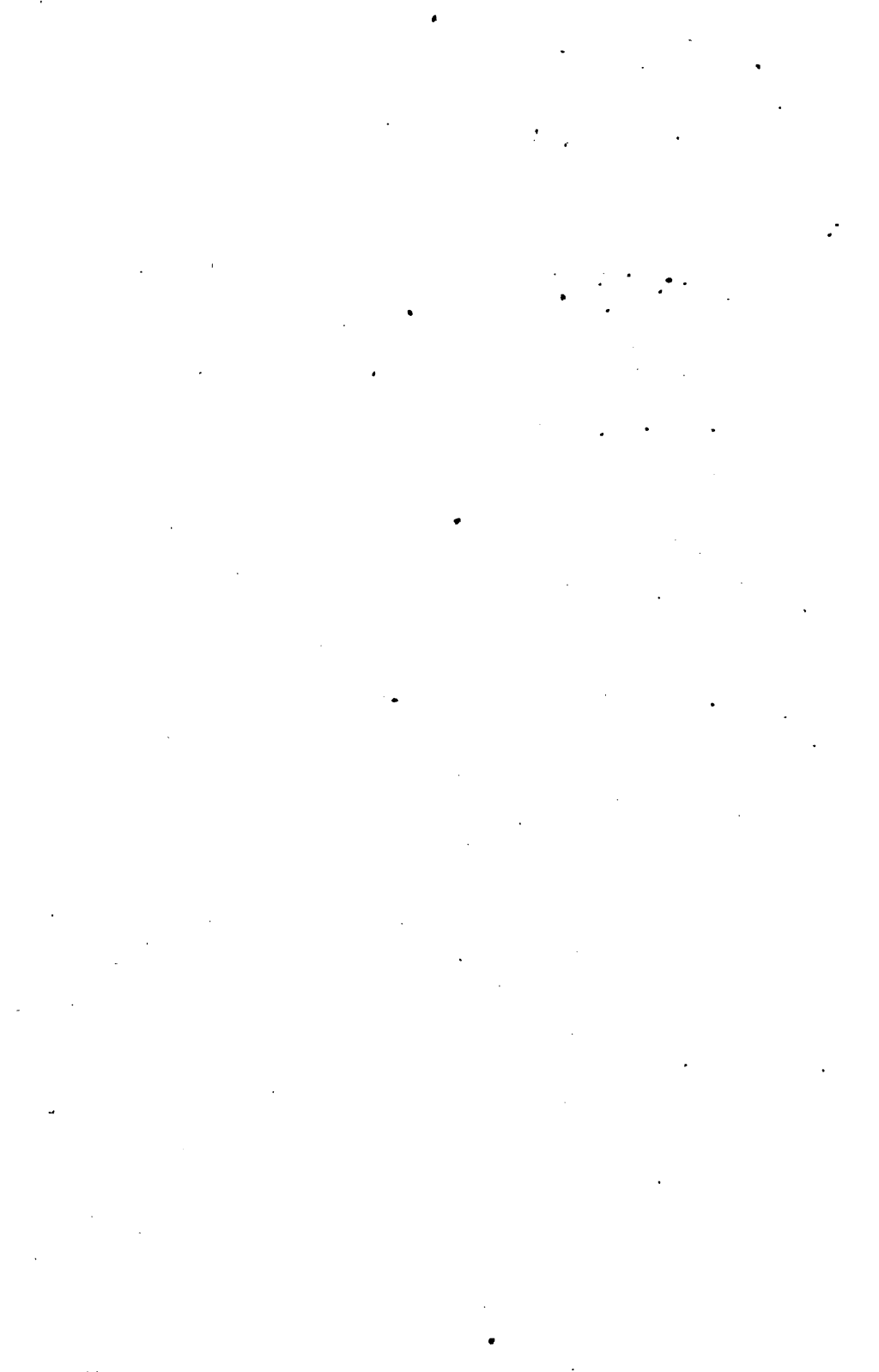
POND LINE.

Sta.	Character of line upon each plane.										Excavation, Embankment, &c. in each Section.										REMARKS.
	Sight Line.	1° Rad. 5730	2° Rad. 2865	Grade per mile.		Le'gth of Plane.	Total Ascent.	Total Descent.	Above C. River.	Excavation			Cub. Yds.	Emb'k. Yards.	Excess Excava.	Excess Emb'k.	Masonry. Cul. Abut.	Grubbing. Feet.	Amount. Dollars.		
				Ascent.	Desc't.					Earth.	Rock.	L. R.									
Fr. 638 or 0 to 12	1200				80.000	1200	18.180	945.659	962.819											19,523.21	End of Sect. No. 3
38	2600				39.600	2600	37.580	626.159	626.159											11,533.78	do. do. No. 4
119	8100		2.640			4.050		930.209	930.209												
152	3300					3300		930.209	930.209												
180	1100	1700			13.200	2800	44.556	923.233	923.233												
195	1500		17.582		1500	9.050		928.233	928.233												
295	6800	3200	59.400		10000	121.550		1040.733	1040.733												
359	4800	1600	12.302		6400	136.550		1055.733	1055.733												
377	1800				1800			1055.733	1055.733												
407	3000		20.592		3000	148.250		1066.653	1066.653												
428	500	1600	2.011		2100	149.050		1068.233	1068.233												
Totals.	34700	6400	1700		42800																
																	</				

Table No. 8.

West Stockbridge Line.

Sta.	Character of line upon each plane.								Grade.		Excavation, Embankment, &c. in each Section.										REMARKS.		
	Sir'gt Line.	20° Rad. 2865	21° Rad. 2346	22° Rad. 2292	23° Rad. 2083	24° Rad. 1910	25° Rad. 1637	26° Rad. 1348	Length of Plane. per M.	Desct. per M.	Total Discent.	Above Cl. River.	Excavation.		Excav. Cubic Yards.	Em'k. Exca.	Em'k. Cul.	Masur'y.		Grub- bing feet.		Amount, Dolls. C.	
													Earth.	Rock.				Excav.	Perches.				Abut.
1212 1/2 or 0 to 127	4275											1018.533		22566		33067		10501	140	525	70	10,332.21	End of Sect. 1 at Sta. 7
200	3900	900	2575	1900	2100	450	1400	50.952	12700		122.555	895.978		37835	2338	64854	24631	305	700	50	19,671.29	do. No. 2 at Sta. 141	
								34.320	7300	170.005	849.898	30952	5483	2487	33948		80	100	40		12,792.20	do. No. 3.	
Totals.	8175	900	2575	1900	2400	2200	450	1400	20000			91353	7221	100408	33948	35182	525	1395	160	500	42,795.70		
	18°	37° 59'	47° 30'	66°	66°	115° 45'	59° 30'																



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